



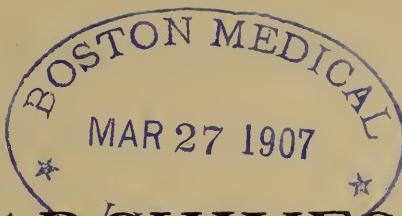
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# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

*Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.*

VOLUME THREE

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Fig. I.

Mrs. F. Taken immediately after bismuth meal in the prone position. A second picture taken directly after *in the upright position* showed the lower border of the stomach not far from symphysis tubes.

Taken with a Walter No. 6 tube, anti-cathode 20 inches from plate, exposure 10 seconds. Penny on the navel.



Fig. 2.

Agnes B. Gastric dilatation and ptosis, taken immediately after bismuth meal. Entire stomach outlined by bismuth and gas. Right kidney was freely movable and completely prolapsed.

Walter No. 6 tube, exposure 10 seconds, prone position.



Fig. 3.

Nellie N. Four and three-fourths hours after bismuth meal. Spasmodic contraction of the stomach divides it into an upper portion filled with gas, and a lower containing bismuth. The contracted part looks like a mere sinus.

Taken with Walter No. 6 tube, anti-cathode 20 inches from plate, exposure 10 seconds, prone position. Penny on navel.



Fig. 4.

Miss J. Hysterical meteorism. Thirty-one hours after bismuth meal. Ascending colon spasmically contracted as if tied off by a string. Much gas in descending colon.

Taken with Walter No. 6 tube, cathode 20 inches from plate, exposure 10 seconds, standing position. Penny on navel.

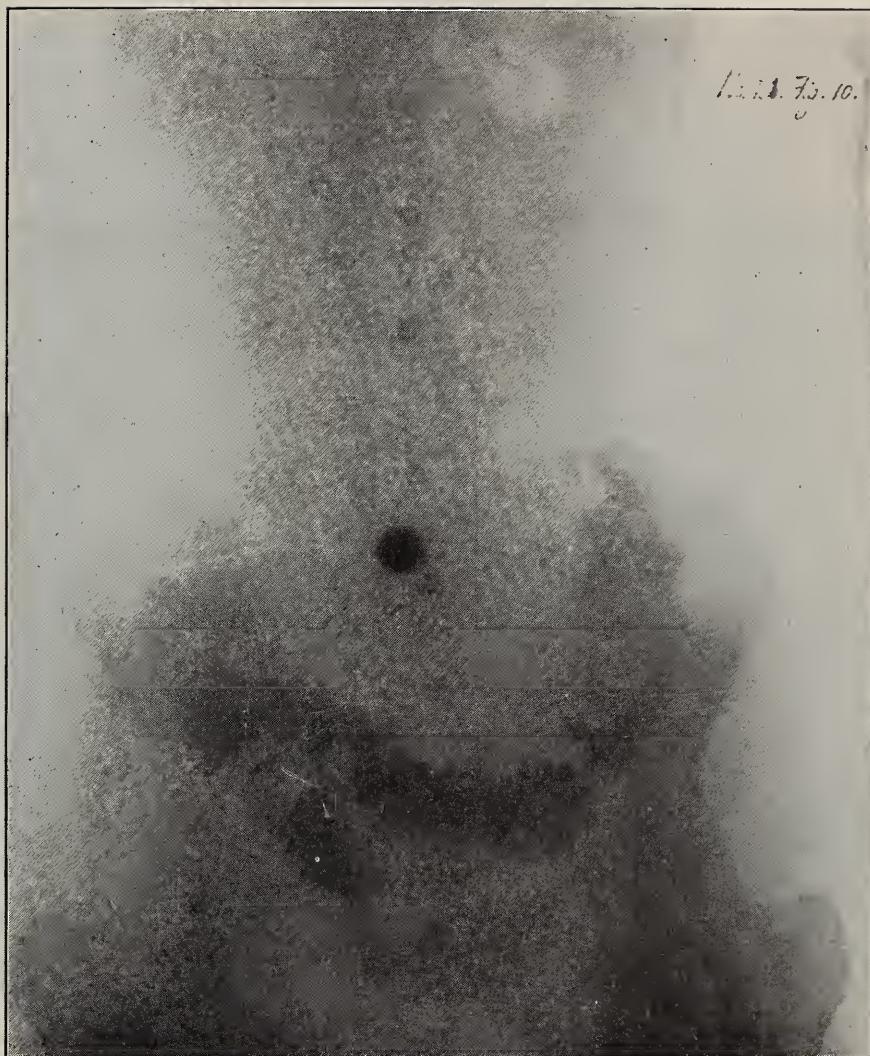


Fig. 5.

Mrs. L. Prolapsed colon. This subject was referred for roentgenography as a typically normal woman, in order to furnish normal data.

The roentgenograph, taken 21 hours after the bismuth meal, showed that both splenic and hepatic flexures were markedly prolapsed, the transverse colon resting upon the bladder and uterus.

Taken with Walter No. 6 tube, anti-cathode 20 inches from plate, standing position. Penny on navel *not opposite* fourth lumbar vertebra.

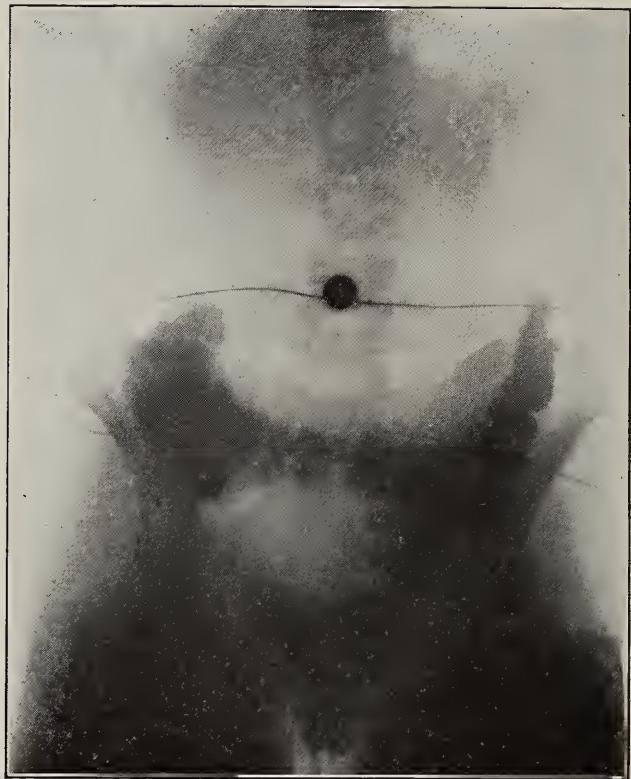


Fig. 6.

Mrs. M. Stereoscopic skiagraph of colon. This subject was supposed to be normal and chosen as a model for that reason, yet the roentgenograph shows the colon much displaced.

Taken with a Walter No. 6 tube, anti-cathode 20 inches from plate, exposure 10 seconds, standing position. A copper wire surrounded the waist and a penny was placed on the navel.

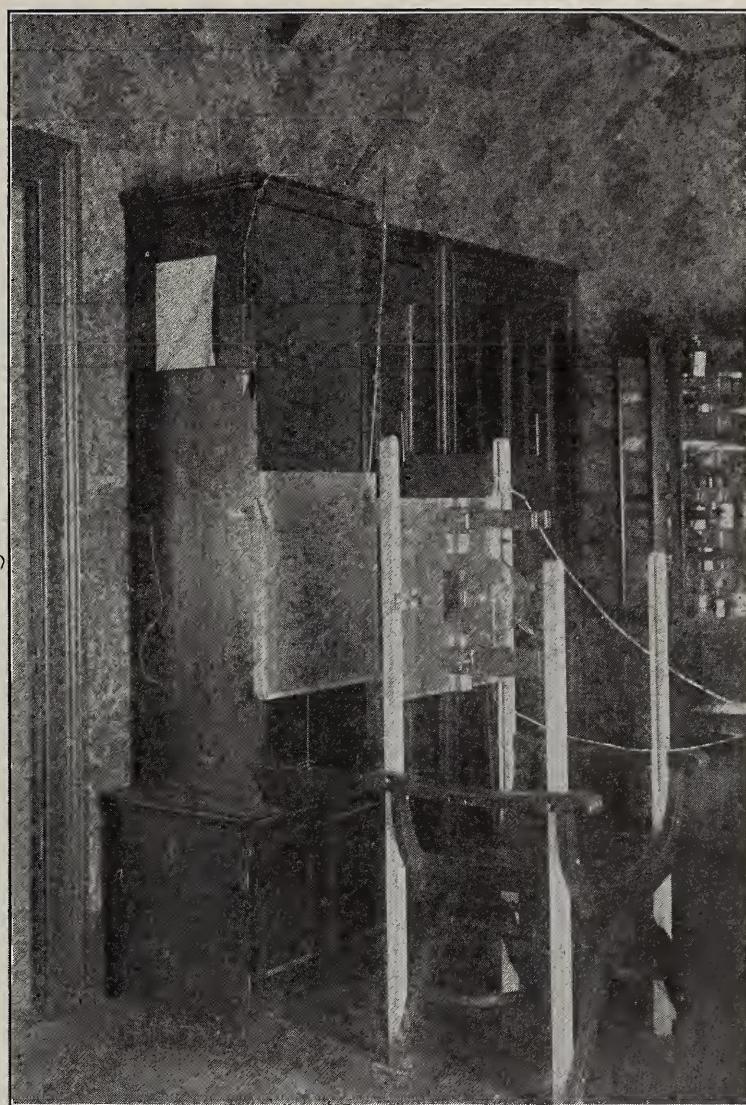


Fig. 7.

Tube-holder to roentgenograph stomach and colon in standing position. Plate-holder clamped on cabinet (used for fluoroscopy of heart and lungs) diaphragm.

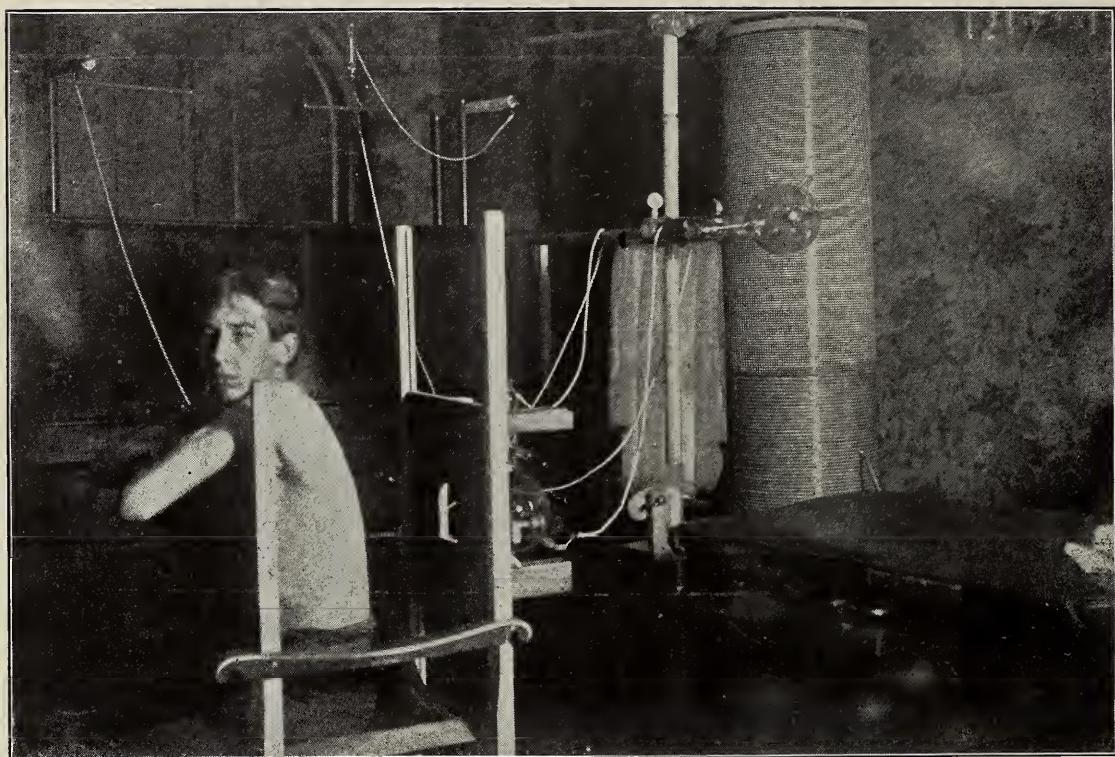


Fig. 8.

Chair, plate-holder, diaphragm and tube-holder for roentgenographing stomach (or chest) in sitting position.



# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

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## ROENTGENOGRAPHY IN DISEASES OF THE STOMACH AND INTESTINES \*

BY HENRY HULST, A.M., M.D., OF GRAND RAPIDS, MICHIGAN

*President of the American Roentgen Ray Society, etc.*

OWING to the researches of Ewald, Boas, Van Noorden, Einhorn, Hemmeter, the stomach and intestines are receiving more attention than ever before. As a result not only the stomacho-enterologist but the general practitioner as well is impressed with the importance of the study of these organs.

Bouchard recognizes in dilatation of the stomach the cause of several forms of auto-intoxication (1). The gynecologist W. Gill Wylie attributes to enteroptosis much of the suffering of women generally referred to displacements of pelvic organs (2). Reed agrees with Stockton when the latter states that more than 50 per cent. of all civilized women in all classes of life have developed the condition known as enteroptosis, and that "this condition more than any other cause is responsible for the constipation,

backache, debility, biliaryness, early loss of complexion, headache, and that long list of ailments of which so many women in all civilized countries are victims."

(3). Reed found in a total number of 710 cases examined by him 362 in whom the greater curvature of the stomach was at or below the umbilicus. Of these 362, two-thirds were females. "We notice, then," remarks Bouchard, "in individuals who present the physical signs of dilation of the stomach, first, pulmonary phthisis; second, chlorosis (both of which accompany gastric dilatation,—the first in two-thirds of the cases, the second in four-fifths); third, nervous or hypochondriac symptoms. We see men without energy who present themselves at the hospital because they can no longer work on account of physical and mental debility; we make an error in diagnosis. Fourth and lastly, other symptoms, so varied and so numerous that their mention at first provokes incredulity" (4). Arneill inclines to similar views (5). According to Meynert the normal position of the stomach in the female sex is

\* Read at the Sixth Annual Meeting of the American Roentgen Ray Society at Baltimore, Md., September 28-30, 1905.

the exception (6). In the male it is more difficult to recognize on account of the rigid abdomen (7).

Now if there is any truth in all this, if Glenard's disease, as splanchnoptosis has been called since 1885, is as common as authorities would have us believe, and causes but a moiety of the suffering now traced to it, though formerly ascribed to other causes, no one is more directly concerned with this affection than is the general practitioner. To him especially it becomes a matter of the most vital importance to be able, under all circumstances, to recognize it and to determine accurately its degree of severity.

But just this has been hitherto by no means an easy task, as is well illustrated by the very fact that, in spite of the work done on frozen and hardened cadavers by His, Sernoff, Mall, Birmingham, and in spite of the enormous mass of clinical data collected by specialists in their daily observation, the position of the stomach in the living subject still remains a matter of controversy. The vertical stomach is still spoken of as abnormal by the followers of Luschka, though Doyen and his disciples insist that the normal, and not merely the embryonic, position of the stomach is vertical. And as to the colon, Billings sums up the matter thus: "The introduction of a rectal tube and blowing in air or water and noting the position of the end of the tube by auscultation and percussion, the distention of the colon by air or water, are the diagnostic methods recommended by Hemmeter" (9). Howard Kelly demonstrated transillumination of the colon in 1891 (10).

What these methods have amounted to practically is well indicated by Reed as follows: "Hitherto most colonic displacements have not been recognized during life; but in the record of autopsies in the hospitals of the world large numbers of them have been collected" (11). Bouchard admits frankly that "percussion is difficult and delicate to practice:

sometimes insufficient; and is rendered false in its results owing to tympanites of the colon," and that "succession furnishes no certain sign; it may bring out the noise of fluid in a normal stomach, and yet it cannot reveal the extent of the dilatation" (12).

Indeed, in the hands of most, the older methods of inspection, palpation, auscultation, percussion, auscultatory percussion, with and without inflation by the pump or carbonic acid gas, electrodiaphany, fluorescing electrodiaphany, the use of bougies, Tuerck's gyromele, not to mention other methods, frequently yield but indifferent results; and in certain cases, such as aneurism, ulcer, and cancer, are decidedly unsafe as well.

Einhorn's recent attempt to radiograph the stomach by means of radium bromide introduced into the stomach, and kept there one or two hours with a photographic plate placed dorsally or ventrally, though very interesting in itself, resulted in nothing very useful, as his illustrated article in the September number of *THE ARCHIVES OF PHYSIOLOGICAL THERAPY* indicates (13).

In view of the difficulty of determining accurately the shape, size, and position of the stomach and intestines by the methods hitherto in vogue, it may seem strange that the Roentgen rays have not been requisitioned into service in this interesting field of clinical research. Sporadic efforts, it is true, have not been wanting. Hemmeter tried to roentgenograph the stomach as early as 1896, but concluded that "so far the Roentgen rays have offered no decided aid for the diagnosis of intestinal diseases" (14). In 1903 he wrote, "Recently I have used the following method: The dilated stomach is coated internally with bismuth subnitrate by means of the powder-blower; thereafter its outline can be distinctly recognized through the fluoroscope" (15). About the same time (1897) Williams of Boston made several observations by means of the bis-

muth method.

But the Roentgen rays failed, nevertheless, to secure for themselves universal recognition by the profession as a valuable, and therefore indispensable means in the diagnosis of enteroptosis, gastrectasia, and allied conditions. It is unfortunately true, as Koehler remarks in speaking of the roentgenography of bones, that "there are not only thousands of ordinary physicians, but hundreds of authorities as well, in their respective fields, who look upon roentgenological examinations as a superfluous luxury as 'photographische Spielerei'" (16). If true in general this applies with even greater force to roentgenography of the soft contents of the chest and of the abdomen. But the beautiful work recently done on this subject by Professor Rieder of Munich should be as epoch-making as was his roentgenography of the lungs, and should open up a new and fertile field of research for the roentgenologist while offering a boon to every serious general practitioner and stomacho-enterologist (17).

### Technic

There is really very little that is new in this method, just as there was nothing new in Roentgen's method when he discovered the rays now called by his name.

The difference of density of the tissues of the thoracic organs, which makes it comparatively easy to roentgenograph them, is just what is lacking in those of the abdomen, except for occasional accumulations of gas in the stomach and bowels. To create this necessary difference we may inflate these organs as is done for purposes of percussion after the manner of the older methods. But inflation is often painful, at times dangerous, and not always adequate. The ingestion of some substance opaque to the rays, free from arsenic, and safe to be taken in large quantities, naturally oc-

curs to every roentgenologist. There is nothing new in this use of bismuth sub-nitrate. It and sheet lead are to the roentgenologist what cotton and gauze are to the surgeon.

Williams gave an ounce of bismuth in emulsion as early as 1897 (18). Though cases of poisoning have been reported in which bismuth was used as a dressing for burns as recommended by Bardeleben, and in which the bismuth was proved to be perfectly pure (19), Rieder observed no ill effects from its use when given in large doses internally (20). I myself have administered it in one-ounce doses in 30 cases, and have seen no ill effects.

Williams' work was mainly fluoroscopic. "The outline of the stomach," he remarks, "was better defined on the fluoroscopic screen because the stomach moves during respiration, and therefore its outlines are blurred on the radiograph" (21). Peristalsis also causes blurring. What more natural, therefore, than to reduce the time of exposure to a few seconds only? Rieder had but to apply the skill acquired by him in roentgenography of the lungs to that of the stomach and intestines and the thing was done. It seems all very simple now. The subject receives a pint or more of milk — the capacity of the normal stomach being about 3 pints (22) — or of bread and milk, or of potato soup, into which has been stirred one ounce or more of the bismuth salt.

Immediately after this bismuth meal two dorso-ventral exposures are made, one in the erect (standing or sitting), and one in the recumbent position. The reason for this will become apparent later on. "If the practitioner does not wish the bismuth to pass on into the intestines, the stomach may be freed from it by means of the stomach-tube," remarks Williams in this connection (23). But this would not serve our purpose at all; for we want the bismuth to pass on and thus enable us to learn still more.

Having determined the size, shape, and position of the stomach by the roentgenographs now obtained, we want to know something about its efficiency next. For just as a normal stomach gets rid of a Riegel-Leubschen Probemahlzeit in from 5 to 7 hours (24), experience shows that it empties itself of the bismuth meal in about the same length of time (25). Supposing that the first roentgenographs were taken at noon, the next one should be made at about six o'clock, the subject having taken neither fluids nor solids since noon. In case bismuth is found remaining in the lower segment of the stomach at six o'clock, as is sure to occur in gastric insufficiency (whether from dilatation, atony, or obstruction from any cause), other exposures may be made at such intervals as seem best to determine accurately the length of time the stomach requires to empty itself. This gives the degree of insufficiency.

We have now ascertained about the stomach all that we can by our method, but in its passage through the bowels the bismuth may teach us still more. By making an exposure before bed-time or the next morning (10 or 20 hours after the bismuth meal), or later still if the patient gives a history of constipation (say 36 to 48 hours from the time the bismuth meal was taken), we may succeed, indeed, we are almost certain to succeed, in obtaining a good idea of the location of the colon, especially its two flexures and its transverse portion. "To give a dram of bismuth twice or thrice daily, some time before meals for two days preceding," as Reed suggests (26), is in reality a work of supererogation. It is based, moreover, upon the mistaken theory that the bismuth collects in the stomach. A single meal is amply sufficient to give a perfectly clear picture of this viscus, and six hours later a roentgenograph of a normal stomach will show no bismuth in it, but the bismuth will have entered upon its final, long,

30 foot journey.

If for any reason a serviceable picture of the colon is not secured by this stomach route of the bismuth method, it is still possible to secure one by the rectal method. Two or three ounces of bismuth in a quart of water is slowly introduced into the colon by means of a rectal tube. In my own experience this has never been necessary.

Some other points remain to be considered. It is not enough to obtain differentiation of tissues by means of the introduction of some opaque substance like bismuth subnitrate, and then merely to press the button. The object to be roentgenographed must be at rest. This rule applies inflexibly here as in all other cases. There must be no breathing, and as little peristalsis as possible, to get the best results. If only the exposure is made sufficiently short after full inspiration or forced expiration narcotics to allay peristalsis are unnecessary. In case of inadequate apparatus or great corpulence of the subject one or even two tungstate of calcium intensifying screens may be needed. Although the contrast obtained by their use is inevitably at the expense of some detail they are not altogether objectionable in abdominal work of this kind provided they are of superior quality. For although in roentgenography of early phthisis intensifying screens are to be avoided because their use may defeat the very purpose of this work (the recognition of minute lung changes), the same objection cannot obtain equally in roentgenography of the stomach and colon, in which we seek for detail less and for contrast more.

With a 16-inch coil, Wehnelt interruptor, but one intensifying screen, a strong tube yielding Walter No. 6 rays, placed 20 inches from the plate, I have succeeded easily in roentgenographing the stomach of a medium-sized subject in one second. I have a very good plate taken under the same conditions but

without the use of intensifying screens, in three seconds. Ordinarily, however, I prefer to balance roentgenographic factors in such a manner as to make the exposure for stomach and bowels at 20 inches in 10 seconds without intensifying screens. A fact well pointed out by Caldwell, but not yet sufficiently understood by all who attempt soft-tissue work, is that the detail of soft tissues is best obtained by relatively high tubes and short exposures (27). The reason, however, for shortening the exposure in this abdominal work is a very different one, the purpose being not to secure minute detail, as in the case in roentgenography of the lungs, but to eliminate the bad effects of motion,—motion of respiration and motion of peristalsis.

Even so the vagrant rays generated when using a Walter No. 6 tube are considerable, and quite sufficient to blur the picture. It has been pointed out frequently (28), that the function of the diaphragm is still not sufficiently appreciated; it requires, however, but little experience to become convinced of its imperative necessity in work of this kind.

The next point of technic to be considered is of vital importance. We must not lose sight of our purpose. This is to obtain truthful information and not merely to make a pretty picture. By placing the tube too near the object we cause undue distortion; also by putting it too high or too low. For the sake of uniformity of results, which may serve as a basis of comparison, one must adhere to a fixed distance between plate and anticathode. I have adopted 20 inches.

In all works on the stomach the navel serves as an important land-mark. Thus Butler says: "The lower border of a normal but much-distended stomach may be found at the level of the navel. If below the umbilicus the condition is abnormal" (29). Unfortunately its position is by no means identical in all cases. According to Quain, "It is gen-

erally a little (half an inch to an inch) above the highest point of the iliac crest, and about opposite the disc between the third and fourth lumbar vertebræ" (30). I therefore mark this point of the spine opposite to which the navel is found in normal bodies by means of a pen or dermatographic pencil before posing the subject and centering the focus on the anticathode perpendicular to this mark. The actual position of the umbilicus may be indicated by means of a dime held on by sticking plaster.

According to Butler the cardiac orifice of the stomach lies four and one-half inches from the anterior surface of the body (31). Robson and Moynihan place the pyloric end two inches in front of the cardiac end (32). This would locate the pylorus two and one-half inches from the surface of the abdomen. According to all the authorities I have been able to consult the greater curvature approaches the surface of the abdomen according to the degree of its distention. Now if the lower border of a given stomach is one inch above or below the perpendicular between the focus of the tube and the third lumbar disc, and about two inches from the skin (depending of course on the amount of fat present), it will appear on the picture about one-eighth of an inch out of its true place, provided the focus is 20 inches from the plate. If, on the other hand, the lowest point of the greater curvature is two inches above or below the perpendicular it will appear about five-sixteenths of an inch higher or lower, as the case may be, than it is in reality. It may be difficult to get the focus exactly perpendicular to the third lumbar disc. A mistake of one inch, the greater curvature being two inches from the surface, will cause a distortion upwards or downwards of but a fraction of one inch. The distortion would be lessened by increasing the distance between focus and plate, but unfortunately this would increase the necessary length of

exposure about according to the square of the distance. The present method, therefore, though not aiming at ortho-diagrammatic exactitude, yields data of such accuracy and practical usefulness as to excel all other methods hitherto in use.

Contrast, immovability, all possible elimination of vagrant rays, truthfulness, having been thus provided for, there still remain one or two things to bear in mind.

My first stomach cases were roentgenographed in the dorsoventral horizontal position. An interesting experience taught me the inadequacy of this method in an unexpected manner. Case No. 15 of the series reported in the September number of the "Physician and Surgeon," published in Ann Arbor, was done in the manner mentioned above. This subject presented no gastric symptoms of any kind and was roentgenographed for the purpose of obtaining data on normal stomachs. The lowest point of the greater curvature was found on a level with the third lumbar disc; that of the lesser, one vertebra higher. The next picture was taken an hour later, but this time with the patient in an erect position, and showed the lowest point of the greater curvature one hand-breadth below the umbilicus, while that of the lesser was found opposite the sacroiliac synchondrosis.

This single instance may serve to show two important facts. First, that, though Boas says that the dorsal position is the most appropriate one for percussing (33), Musser is right in insisting that the patient must always be examined in the erect as well as the recumbent position (34). For the marked gastrophtosis present in this case was not revealed in the first picture, and would have escaped detection had not the patient been roentgenographed in the sitting position as well. Second, this case serves to illustrate the significant fact that only a physical examination can determine the pres-

ence or absence of Glenard's disease; and that the mere absence of subjective symptoms counts for nothing in the negative diagnosis of this condition.

The normal stomach, on the contrary, does not descend markedly upon assuming the erect position. At any rate, the few normal stomachs I have been able to find remained very much the same in both conditions.

I shall have occasion to show you a case of gastrophtosis taken first after full inspiration and next after complete expiration. You will agree with me that the difference caused by respiration, in this case at least, is quite negligible.

Kuttner and Jacobson maintain that when transillumination (by electrodiaphany) shows distinct respiratory movement of the light zone the lesser curvature is in its normal position; and if the light zone is below the umbilicus these signs together indicate a dilatation, provided transillumination through the intestines can be excluded (35).

To my surprise, the few normal stomachs that I have been able to find showed no more respiratory movement than the prolapsed ones. A roentgenograph of a silver nitrate pill in the pyloric end of the stomach presented by me at the Philadelphia meeting of our society is of interest in this connection. The pill was opposite the third lumbar vertebra, and yet the movements of respiration during the one and one-half minute exposure caused the round pill to appear only slightly oval. The Kuttner-Jacobson sign, therefore, is to say the least, not infallible.

Further experience may induce us to view differently the effect of respiration upon the position of the greater and lesser curvatures of the stomach in health and in disease, but two things are therefore established now: the influence of the position of the body upon that of the stomach should not be ignored, and the degree of prolapse cannot be accurately determined by an examination in the

horizontal position alone.

And yet it may pay very well to take a picture in this manner for other reasons. When the subject lies upon the belly the stomach is brought nearer to the plate than when he sits or stands; when he lies down upon the plate the picture is clearer and more distinct. Also, in this manner, gravity causes the bismuth to settle upon the ventral surface of the stomach, thus permitting a better view of the fundus, cardiac end and general contour than is always obtained by the examination in the erect position alone, in which latter case the bismuth sinks into its most dependent portion, and by its presence serves rather to reveal the lowest points of its two curvatures.

I found it desirable to construct a chair combining plate-holder, adjustable tube-holder, and diaphragm, facilitating roentgenography of feeble patients in the sitting position, so as to secure 20 inches between plate and focus. In order not to increase the paraphernalia only too likely to accumulate in a roentgenological laboratory I utilized the graduated tube-holders belonging to my compression-camera. For the standing position the same diaphragm, running in grooves and held by set-screws at any desired height, is reversed upon the chair, the plate-holder is clamped upon a cabinet designed for fluoroscopic examination of the heart and lungs, but made to serve as well as a support for the patient to lean up against. A screen projection will show all this at a glance. For the recumbent position the framework of my compression-camera is closed down over the patient, and the above described tube-carrying diaphragm is placed upon the frame acting as a support in such a way as to keep the focus 20 inches from the plate.

#### *Conclusions*

The above-described method was applied by me in the examination of 30

cases. Twenty-two of these are reported in detail in the September number of the "Physician and Surgeon" of Ann Arbor.

The present occasion does not permit entering into an analysis of them. Also, I shall resist the temptation of indulging in extensive generalization. My experience is quite limited and does not warrant me to make sweeping statements nor to herald novel and revolutionary ideas. Further observations by many other observers is needed in order to arrive at such conclusions without jumping at them.

I shall therefore content myself with demonstrating slides of some of the 150 14 x 17 inch negatives I have hitherto made, two or three of the negatives themselves to supplement the former, and, as somewhat of a curiosity, a reduced stereoscopic positive of a colon. Lastly, permit me to summarize as follows:

Diseases of the stomach and intestines, especially Glenard's disease, are receiving unusual attention and are of special interest to the general practitioner.

Their accurate diagnosis is attended with considerable difficulty, as is proven by the number of methods advanced.

The present method, though not as simple as some others, is both safe and accurate.

Its difficulties are not insuperable.

Good apparatus and a fair amount of skill suffice to ensure thoroughly satisfactory results.

Truthfulness is the chief criterion of merit in this work. Beautiful caricatures, the fruit of roentgenological calisthenics, are out of place.

To be truthful and thus answer their purpose, roentgenographs must be made correctly and interpreted according to the laws of projection. They should be the result of a uniform method to serve as a basis of comparison.

A Walter No. 6 tube ordinarily gives

the best results. Children may be examined with a still softer tube.

The diaphragm is quite indispensable.

It is more than likely that this method will modify the current topography of the stomach and intestines on several important points.

Roentgenography of the stomach and intestines opens up a new and interesting as well as exceedingly wide field of research, it urgently invites us to put forth our very best efforts, and promises rich results.

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### Discussion

Dr. GEO. E. PFAHLER (Philadelphia) said that the condition of floating stomach is not generally recognized; it can be demonstrated easily.

Dr. CHAS. L. LEONARD (Philadelphia) said that he had demonstrated a case of gastrophtosis before the American Medical Association as early as 1897.

Dr. G. G. BURDICK (Chicago) said that several years ago he radiographed a case of supposed tumor of the stomach, and he was able to show that the tumor had no connection whatever with the stomach. Incidentally the patient suffered with symptoms of arsenical poisoning, evidently due to contamination of the bismuth with arsenic.

# ROENTGEN RAYS IN MILITARY SURGERY \*

BY CHARLES FRANCIS STOKES, M.D.,

*Surgeon in the United States Navy and Professor of Military and Operative Surgery  
at the U. S. Naval Medical School*

**W**HEN the peculiar penetrating properties and shadow effects of X-rays were made known to the world by Wilhelm Konrad Roentgen, military surgeons became keenly alive to the fact that the solution of a puzzling problem was close at hand.

At this time they were studying the curious effects of a new missile in warfare. This new missile had a core of lead, a hard jacket of steel, or cupronickel, an ogival head, and a diminutive caliber; still with an initial velocity of 2,300 feet a second, the enormous striking energy of some 2,000 foot pounds was developed, giving this new bullet marvelous penetrating powers and appalling destructive effects. At some ranges bones and soft parts showed clean perforations while at other ranges curious disruptive effects were noted. We would see a run of clean perforations of bones and soft parts and be quite prepared to pronounce the new projectile humane, when other effects at other ranges would be brought to our attention and an opinion to the contrary would seem justified.

At close range compact bone is generally extensively shattered, soft parts torn asunder, fluid saturated organs, like the bladder and stomach, disrupted, and the brain pulpified. In some cases we would find a small, clean-cut wound of entrance and a normal wound of exit, while within the skin there would be little more than a pulpified mass of muscle and bone fragments. The writer had two such cases under treatment after the battle of San Juan Hill.

The so-called wedge-shaped types of fractures and their modifications predominate, and make their study with Roentgen rays a matter of great importance, practically a necessity.

It was thought that lodged bullets under the new conditions would become extreme rarities, but strange to say, they and other foreign bodies are found in about ten per cent. of the wounded.

This unexpected development is explained by the fact that the men now deploy while fighting and seek cover behind trees, earth, or other protection, which the bullets sometimes penetrate almost spent, or they ricochet, and lodge. At the proper time, localizing radiography finds a useful field in these cases.

In naval warfare wounds from shell fragments and splinters cause over 90 per cent. of the casualties. Their destructive effects are often mutilating in the extreme, and the guiding light of the X-ray is practically a necessity in their treatment.

A Spanish shell exploded between decks on the *Texas* off the coast of Cuba killing one man and wounding eight others. The wounded were brought on board the ambulance-ship *Solace* shortly afterward where the search for splinters and shell fragments was prolonged, tedious, and trying. After the naval battle of Santiago a wounded Spanish sailor was brought along side the *Solace* in a small boat, and he walked on board and to a cot that had been assigned him. Later we removed a shell fragment from his abdomen and a strip of his jacket which he had torn off and stuffed into the wound to check the ooze. Shell fragments have a low velocity as a rule, and in consequence very commonly lodge and are often difficult to locate. We not infrequently see innocent-looking skin wounds concealing be-

\* Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Md., September 28-30, 1905.

neath them shell fragments, comminuted bones and disorganized joints.

The writer has described in a cursory way a few of the types of wounds military surgeons are confronted with in order that you may see what an important part Roentgen rays are destined to play in military surgery both afloat and ashore.

Major La Garde, a pioneer in the field of X-rays in military surgery, has made exhaustive studies with X-rays of the effects of modern bullets on cadavers. The writer has had the privilege of using some of his radiographic slides for lecture-room demonstrations. It is plain that in gun-shot wounds where tension, density, fluid-saturation, and other factors come into play it cannot be said that these post-mortem bullet wound lesions are quite true to life.

Before considering matters of technic and equipment in military surgery in time of war, the writer will say a word about military surgeons and their work in times of peace. It is generally supposed that naval surgeons spend most of their time on board ship treating grossly healthy young adults, and in indulging in habits of indolence to the full extent. It is well-nigh impossible for our brothers in civil life to take medical officers of the army and navy seriously in a professional way. In this a great injustice is done us. You will be surprised to hear that, in all probability, our field is broader and more varied in almost every branch of medicine than is yours in civil life, but we are not privileged to see the hordes of cases that collect in the great centers.

The writer employs X-rays only in conjunction with his work in general and military surgery. One or two of his recent cases have been of sufficient interest to merit reporting.

*Case I.*—Hodgkins disease. Patient *æt.* 53 years, the wife of an officer, was sent to the writer for operative treatment of tumors the size of a

fist in each groin, and others in the post-cervical region on the right side. There were masses in the pelvis on the right side; the spleen was not materially enlarged. Syphilis and tuberculosis were excluded. A diagnosis of Hodgkins disease was made, and later on was confirmed by Harvey Cushing of Johns Hopkins Hospital. The patient could take but little arsenic, still it was exhibited from time to time.

She was X-rayed twice a week for one month, then once a week until 18 exposures in all had been given. The treatment was continuous except for a break of two weeks beginning January 7, 1905, and discontinued May 1st, the tumors having completely disappeared. Dosage: 3 minute exposures with a 70 cm. Gundelach tube, distance 8 inches, low voltage and amperage, slow interruptions. This patient reports no return of symptoms under date of September, 1905.

*Case II.*—Boy 6 years of age; kernel of peanut in right lung; located with fluoroscope and radiograph at right fourth intercostal space about an inch outside the sternum, confirmed by the physical signs with subsequent clearing up and recovery.

*Case III.*—Fracture of the carpal scaphoid.

*Case IV.*—Two epitheliomata on the face of the same patient, each three-fourths of an inch in diameter; one located on the left cheek, the other on the left side of the nose. The growth on the cheek yielded promptly to the same dosage as employed in *Case I.*, while the lesion on the nose has stubbornly resisted treatment until quite recently. It is probable that the difference in circulation and nutrition in the two parts accounts for the difference in behavior under this treatment. In the matter of technic in kidney work the long exposures with low voltage and amperage, and slow interruptions, as recommended by Dr. Leonard, have given the best re-

sults in my hands. The rapid work does well with the extremities and thorax.

It is not generally known that the navy has in commission hospitals of good size in most of the important cities on the Atlantic, Pacific, and Gulf coasts, and smaller hospitals in Porto Rico, Alaska, Hawaii, Samoa, Guam, the Philippines, and Japan. The larger hospitals are superbly equipped with Roentgen-ray apparatus modeled after an outfit devised by the writer about two years ago, with the coöperation of the Kny-Scheerer Company. The entire plant is mounted on a steel truck with rubber-tired wheels, is easily mobile, and can be used in lecture-rooms, wards, or laboratories, as occasion may demand. The army hospitals are amply provided with apparatus.

During hostilities there are definite situations in which Roentgen rays are employed in both the army and the navy. In the field assistance is given the wounded at the firing line and at several points in the rear until the base hospital is reached.

At the firing line hemorrhage is checked, first-aid dressings are applied, and the wounded prepared for transportation to the dressing stations which are 300 or 400 yards back and under cover. Here men are nourished, stimulated, identified, and tagged. Tourniquets are removed and dressings further secured. The next point at which assistance is given is in the field hospital, several hundred yards further toward the base. Here operations of necessity are performed. The patients are carried still further back until they are finally lodged in a base hospital. It is at this point that permanent treatment begins, and it is here that we employ X-rays with such immense profit in diagnosis and treatment. The base hospital is more or less of a premanency while the other stations are planned to be mobile.

In the navy under certain conditions a hospital ship, or large man-of-war, be-

comes the base hospital.

Our preparations for battles at sea consist in the establishment of relief stations at many points about the ship where assistance such as is given the wounded on the firing line ashore is rendered. The wounded, when conditions are favorable, are removed thence to the dressing stations. These stations correspond with the field hospitals on shore. At these points operations and dressings of necessity only are performed. The patients are then further prepared for removal to a hospital ship which corresponds with the base hospital in shore operations. On the hospital ships the wounded have access to the benefits of Roentgen-ray apparatus.

The army provides its base hospitals with portable machines which stow compactly in two pieces,—one consisting of the gasoline-driven motor-generator, the other the coil and accessories; the whole, weighing about 1,300 pounds, can be handily carried in the ordinary army wagon. The problem of the weight has been the stumbling block in connection with portability.

During hostilities in South Africa, storage batteries gave great satisfaction as there was always an abundance of electricity to be had in the vicinity of the base hospitals.

The French are experimenting with a radiographic motor wagon which is novel and interesting, and appears to have some value. This apparatus was first tested during the grand manoeuvres of the East in September, 1904. It has the appearance of an ordinary automobile ambulance, and is propelled by a 10-horse power motor which gives it a speed of 25 kilometers an hour. During the manoeuvres it traveled a distance of 2,800 kilometers over the same sort of routes that would probably have been traversed in times of war, and each day either along the road-side, or upon the arrival at the halting-place at the end of the day's march, the wagon was imme-

diately experimented with, from a radiographic standpoint, and gave perfect satisfaction. The X-ray equipment is of the D'Arsonval-Gaiffe type. At the rear of the wagon are two doors opening horizontally, the upper forming a sort of roof for a cloth curtain to be used for dark-room purposes. When the wagon reaches its destination the motor is used to run a dynamo concealed under the seat forward. This radiographic wagon is said to have been used in connection with wireless telegraphy as well as in generating Roentgen rays. It has been suggested that a wagon of this sort might be made use of in cities and towns where X-ray facilities do not exist.

In naval warfare the hospital ship of the future will be found as well equipped in every detail as the hospital on shore. The only *bona fide* hospital ship the navy has at present is equipped with the same type of Roentgen-ray apparatus that is installed in the large naval hospitals.

In our great fleets and where ships are operating singly, there are times when X-rays are urgently in demand in ordinary times of peace. Each monster battle-ship of today is in reality a floating fortress and machine shop combined, manned by 800 odd sailor mechanics.

The everyday traumas are varied and numerous. It is hardly wise to equip each ship with an elaborate plant, still a make-shift outfit can be provided at little expense.

Two years ago the writer established the fact that the wireless telegraphy coils on board ships of war can be employed for generating X-rays. Under his direction a tube, multiple spark gaps, connecting wires, and a fluoroscope were taken on board the battleship *Maine*, and were connected up with the wireless telegraphy coil with most gratifying results. Surgeon General Rixey is planning to equip one or more of the large ships in this way for purposes of experiment along these lines.

In bringing this brief account of the status of Roentgen rays in military surgery to a close, I would like to make an appreciative reference to the excellent work of La Garde, Borden, and Gray, of the United States Army.

It would have been a presumption for the writer to have discussed the details of Roentgen-ray technic before this audience. From a former experience he well knows the profit and pleasure that go with a meeting of the American Roentgen Ray Society, and he is deeply grateful for the privilege of being with you again.

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## REPORT OF A CASE OF PSORIASIS TREATED BY ROENTGENO- THERAPY

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BY S. J. WRIGHT, M.D., OF AKRON, OHIO

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**M**R. H., age 40, fleshy, eyes blue, skin fair, weight nearly 200 lbs. Family history excellent, personal habits correct, no tobacco or liquor being used. Married several years, childless, wife very healthy.

He has had psoriasis for 20 years, covering the trunk, limbs to feet and hands, also on scalp in several places. None on hands, face, or neck above collar. Was bald on top of head and was becoming more so.

Had been treated continuously, both internally and externally, by most emi-

nent specialists in vain. Preparation for bed consumed an hour each night. On rising he would stand in the center of a spread paper, take off his underwear, and gather up a double handful of scales each morning.

Radiation was begun by the writer, October 8, 1904. Each psoriatic center was rayed by a medium vacuum Gundelach tube, anti-cathode 8 inches from the surface, for 5 minutes, gradually increasing to 15 minutes, as seemed indicated by the reaction. A seance would occupy from 3 to 5 hours.

He was treated 14 times in October, 7 times in November. Ten short (because of quicker re-action) seances in December, and 3 very short treatments in January, 1905, were given when he was a well man having lost 18 pounds of superfluous flesh, and enjoying undisturbed sleep and entire freedom from itching and discomfort.

A few weeks after recovery a strip of scalp two inches wide, along the edge of the bald surface, became depilated. In two months the hair all returned, also a vigorous growth of fine hair all over the top of his head, through which, however, the scalp is visible.

In the following May a few spots

appeared on his legs, back, chest, and scalp, and 12 treatments at intervals of from 4 to 8 days were required.

My coil is an 8-inch apparatus excited by the street alternating current of 110 volts; the spark gap was kept at 5 inches and the yellow glow quite pronounced throughout each seance. The patient's corpulence has returned and the scalp is refractory, being treated gingerly lest the hair fall out forever. There was never a dermatitis nor discoloration of the skin from the ray, as would certainly follow so frequent, intense, and prolonged application of rays from a static machine. (The writer has succeeded in discoloring the skin for a very few days in case of cervical adenoma by coil-radiation). Symptoms of toxæmia have never appeared excepting in cases of advanced, active, pulmonary tuberculosis, in the writer's experience.

Several other cases of psoriasis of less degree and duration have yielded nicely to radiation. The writer uses tea-lead to protect mammary and reproductive glands from the blighting effects of X-rays, and urges the use of sunshine as an adjuvant, because of the invariable absence of psoriasis upon parts commonly exposed to the sun's rays.

## EDITORIAL

### A RETROSPECT

**T**HE present issue marks the beginning of the third volume of THE ARCHIVES OF PHYSIOLOGICAL THERAPY, and the end of the first year of its existence. As we look back to the time of its introduction to the medical profession we feel that THE ARCHIVES may well feel satisfied with its progress during that time. Starting in a field at which the profession was still looking askance, with no circulation and no prestige save that conferred by the character of its editorial constituency, it is now universally acknowledged, after one year of existence, to stand easily at the head of all publications of its class in America, if not in the world, from a standpoint of scientific

usefulness, and with a circulation larger than that of any American publication of its class, which reaches nearly every civilized country on the globe.

During this time there have been published in this periodical 42 original articles; full, exhaustive abstracts of nearly 600 original articles appearing in other journals, American and foreign, and which, together with its own original articles, cover thoroughly the literature of physiological therapy that has appeared throughout the world; 115 illustrations of original articles and abstracts; and 50 special half-tone plates of unusual or instructive skiagraphic subjects. As an illustration of the manner in which THE ARCHIVES keeps its agreements it may be stated that, although the subscription price is based, as stated in its prospectus, on each issue containing forty-eight pages of text (from 700 to 750 words to the page, or more text than is given by any other journal of its class in the world) and four illustrations, yet four of the eleven issues have contained *sixty-four* pages of text and the illustrations have averaged *fifteen* per issue.

A gratifying fact demonstrated by the present position of THE ARCHIVES, is that contrary to popular belief, it is possible to produce a successful special journal for general circulation which is constructed primarily for the subscriber's benefit rather than for the securing of a large number of advertising pages at the expense of the subscriber. When this periodical was conceived it was the conviction of the publisher that a journal in which restriction of the advertising matter to pertinent and strictly ethical, high-grade material and elimination of reading notices, either frank or veiled, constituted prominent and constant features, would ultimately, after it had been in existence long enough to convince the profession and the advertisers that observance of these rules was to be its invariable policy, reap adequate and substantial reward; that a confidence on the part of the subscriber that his sense of professional propriety would not be outraged by the exploitation of secret medicinal preparations, the unexpected insertion of advertising matter where it had no right to be, or evidences of a desire on the part of either the editorial or publication constituencies to increase the profits of some particular preparation, apparatus, or money-making institution, would result in a better circulation; and that the advertiser's knowledge that he would get just what he paid for and be treated just as were his competitors, in other words get an absolutely "square deal," would be substantially appreciated by them and improve the quality although it reduced the quantity of the advertising pages.

We are happy to be able to state that the position taken by THE ARCHIVES on both of these points has been amply justified by experience and that this policy will be as strictly adhered to in the future as it has been in the past.

We desire also, in this connection, to render tribute to the indefatigable energy, indomitable perseverance, and generous moral and financial support given to THE ARCHIVES by the publisher, without whose confidence in high ideals and hearty coöperation it would have been impossible to maintain our present standard of scientific excellence, ethical purity, and consistent conservatism.

It would be unreasonable, perhaps, to expect that an enterprise of the grade and scope of THE ARCHIVES could be inaugurated and developed without exciting in some quarters determined opposition, unscrupulous misrepresentation, and venomous though unjustifiable innuendo and criticism. THE ARCHIVES has sustained its share of these in silence, believing that it was best to answer by deeds rather than words: "The proof of the pudding is the eating," and we are content to let THE ARCHIVES speak for itself.

In wishing our readers A Happy New Year, we desire to assure them that the watchwords of THE ARCHIVES will continue to be in the future, as they have been in the past, "Progressiveness, Comprehensiveness, Utility, and Truth."

#### A CASH PRIZE OF FIFTY DOLLARS

will be paid by the publisher of THE ARCHIVES OF PHYSIOLOGICAL THERAPY for the best original, hitherto-unpublished roentgenograph contributed for reproduction, as a Special Plate, in the issue for June, 1906. This is the first of a series of prizes which will be offered from time to time for various original contributions upon subjects pertaining to the practical uses of the several elements of physiological therapy. Details will be found in the advertising pages of this present issue.

# CURRENT PHYSIOLOGICAL THERAPY

## THE JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., November, 1905

1. Radiant Energy and Ionization: Their Relation to Vital Processes and their Derangements — Wm. James Herdman.
2. Relative Action of the Roentgen Ray and Light upon the Enzymes, and their Therapeutic Significance — Edward C. Titus.
3. Mechanical Vibration in the Treatment of Herpes Zoster — William Gray Schauffler.
4. Report of the Committee on Current Classification and Nomenclature.
  1. See THE ARCHIVES, Dec., 1905, p. 349.
  2. See THE ARCHIVES, Dec., 1905, p. 342.
  3. See THE ARCHIVES, Dec., 1905, p. 347.
  4. See THE ARCHIVES for June, 1905.

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## ARCHIVES OF THE ROENTGEN RAY

London, England, November, 1905

1. The Use of the Alternating Current for Medical Radiology — George B. Batten.
2. X-rays in Tertiary Syphilis — Richard J. Cowen.
3. The Exploration of the Thorax by Orthodiagraphy — H. Guilleminot.
4. A Case of Calcified Miliary Tuberclie of the Lungs and Bronchial Glands — Hugh Walsham.
5. Pain in the Back, Accompanied by Menorrhagia, Treated by High-frequency Currents — W. F. Somerville.

I. Batten began to use the alternating current six years ago in radiology, using a rotary converter. In 1901 he devised the Batten rectifier, which splits an alternating into two uni-directional pulsating interrupted currents. Its efficiency is almost 99 per cent. It is used for charging accumulators and gives from three to five amperes at sixty volts. The chemical rectifiers consist of four cells, each with one pole of aluminum, the other being of iron, lead,

or carbon, immersed in a 25 per cent. solution of phosphate of ammonia. They are so connected that the alternating current is supplied to one pair and a uni-directional current is derived from the other pair. By this method the current is rectified only and used to charge accumulators, or supplied directly to the coil. In either case, a separate interrupter is required.

The electrolytic breaks of Wehnelt, Simon and Caldwell, work pretty well without a rectifier. The usual spark coil has an efficiency of only 30 per cent. and requires some form of interrupter, and the X-ray tube excited by them acts but a small proportion of the cycle, in spite of which they are almost universally employed. By means of step-up transformers the alternating current may be used directly without interrupters, but they must be very carefully constructed and various forms of protection for the transformer employed in order to prevent short-circuiting and resonance effects.

The secondary current resulting may be rectified by means of electro-chemical valves; thus, an antimony cell shows a ratio of almost 100 to 1 in suppressing inverse current or the current may be rectified by the Walters Stromspalter, which takes advantage of the fact that a positive current passes from a point across a gap to a plate more easily than from a plate to a point.

The Cooper-Hewitt lamp rectifies but at a considerable cost of current and small amperage. Prof. Weintraub has made a rectifier which will deliver 30 amperes of direct current and can be used in either the primary or the secondary current.

The various forms of vacuum valve tubes contain a comparatively large aluminum electrode at the positive end and a small aluminum mirror at the cathodal end, thus allowing the electrons to travel across the tube carrying current when that current is in the proper direc-

tion, but disperses the electrons in all directions when the reverse is true. A vacuum tube containing an antimony anode and a carbon cathode rectifies very well. The alternating current may, of course, be used to drive a static machine which in turn can be employed to excite X-ray tubes.

For X-ray work the operator uses a 14-inch coil worked direct from the alternating mains, through a step-down transformer, and a rectifying interrupter, in the secondary circuit. He employs a valve tube or two tubes with a spark gap, when he wishes to get fine definition in a radiogram. He also employs a 14-inch coil with a 20-cell storage battery, and a mercury dip interrupter. There are thus a large number of means for the employment of the alternating current without the use of the rotary transformer.

2. Cowan believes that a definite constitutional effect is obtained when a part of the body is exposed to X-rays; thus a patch of lupus which is quite distant from the one under treatment may heal up without being directly exposed to the ray. Again in many cases there is an improvement in the general health following exposure of a part of the body. In still other cases the patient complains bitterly of malaise, weariness and headache, which cannot be reasonably ascribed to the toxic products resulting from a break-down of the growth under treatment, and their occurrence in case where a toxic cause could be eliminated, has caused him to believe in and search for these effects.

Constitutional effects may be produced without the occurrence of dermatitis, also sterility in the male and female, and evidence is accumulating to show that the rays have an influence not only in the spot exposed to their action, but on the whole organism. He has experimented extensively in the treatment of syphilis, diabetes, and chronic diseases of the central nervous system

with results encouraging enough to justify a continuation of the work.

He exposes the whole body, shielding with thin sheet-lead only the genital organs and lower abdomen, with the tube placed 36 inches distant from the body, and made to back up a 4-inch spark-gap. Four tubes are employed, two in front and two in the back. The treatment should not exceed 10 or 12 minutes in duration. One grain of æsculin in a dilute alkaline solution is given three times daily, to excite artificial fluorescence in the blood and tissues of the patient.

In a case of tertiary syphilis acquired 12 years previously and which had been treated with iodide and mercury, but later developed symptoms of brain trouble, vertigo, cloudiness of the left disc, irritability of temper, affection of the speech, slight epileptic attacks, etc., he gave each day an X-ray bath, as described above, for 10 minutes, followed by a light bath every other day. A week of treatment seemed to improve the case, the disc looked healthier, and he was less irritable. Treatment was continued for three months. The patient was restored to health, had gained 10 pounds, the discs were normal, and speech quite recovered. He believes the fluorescence induced by the æsculin played an important part in the cure.

In cases where injury to the nerves had taken place and the mischief was progressing, this treatment succeeded in arresting the process. In a patient with secondary syphilis who had been taking large quantities of mercury and iodide but was steadily getting worse with successive crops of eruption and severe iritis, ulcerated throat, etc., two grains of æsculin was given three times daily, and for two weeks the X-ray bath each day, with a light bath three times a week. Under this treatment the eruption faded and did not reappear, the throat made rapid improvement, general health was better, and in six months all active signs

of the disease vanished. During the whole time he received no medicine whatever. His physician states that he has been well since, with no recurrence. Cowan does not believe that the X-ray has a specific action on the disease but that its curative effect is brought about through the rapid metabolism induced, and the elimination of poisonous products through the skin. He believes the light baths play an important part and for applying them prefers Nernst lamps without glass covers; thus none of the rays are interrupted.

3. Guilleminot says that the image seen upon the screen is a conical projection of organs situated in different planes and distortion for each organ varies according to its distance from the anode. This error may be corrected by orthodiascopy. He constructed in 1898 a frame for holding the tube, which could be moved in a horizontal or vertical direction by means of pulleys and cords, and the screen was arranged to move in unison with the tube, the results being the same as those obtained in the use of the well known orthodiaphragm, and the contour of the heart or the curve of the diaphragm may be thus accurately mapped out.

In using his apparatus he employs a metal cross placed in the course of the normal ray, that is the ray perpendicular to the plane of the screen. The patient is placed in front of the tube-holder, and by means of cords and pulleys the tube is adjusted so that the shadow of the cross (hence the normal ray) falls on the upper edge of the sternal notch. The screen is covered with a ground-glass plate upon which this point is marked for reference. The tube is then moved so as to describe the contour of the heart, and a tracing of it made by hand. The lower part of the cardiac shadow usually runs into the liver, and the upper part is continuous with the shadow of the large vessels. It is necessary, therefore, to judge the posi-

tion of the upper and lower border. The limit of excursion of the diaphragm is then marked on each side, as also the costal angles. The diagram thus obtained may be traced off on paper and preserved for reference.

4. Walsham reports a case of calcification of miliary tubercles of the lungs and bronchial glands. The patient, female, aged 35, complained of pain, stiffening and swelling of the lower cervical vertebrae. She had suffered an attack of pneumonia at 19, five of her mother's family had died of tubercle. A skiagram showed caries of the body of the sixth cervical vertebra, but all through the apex of the left upper lobe were scattered tubercular nodules. The bronchial glands showed with great distinctness, some almost as dense as the shadow cast by the vertebrae themselves. He believes, therefore, that these glands are calcified, for they are not enlarged as a caseous gland would be. They are very dense in a second skiagram taken 18 months later.

He believes the patient had an attack of acute miliary tuberculosis and recovered, the lesion becoming calcified. Observing her for a month he found her temperature normal all the time, and she gained six pounds in weight.

5. Attempts to restore the position and quality of the internal organs are indicated in cases of pain in the back of women who have borne children. Where such treatment is not followed by relief high frequency currents are often valuable.

In a case of endometritis attended by very severe pain in the back, rendering the patient unable to walk or enjoy life, six or seven applications of high-frequency currents has resulted in relief from the pain. The treatment consisted of the condenser couch, the current of 300 to 500 milliamperes, and direct applications to the skin over the sacrum, by the hand of the operator in connection with one terminal, the patient

directly in connection with the other terminal, 400 milliamperes being employed.

Examination of the patient by her gynecologist showed not only relief from the pain, but a considerable improvement in the internal local conditions.

## ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, October 10, 1905

1. Remarks on the Use of Barium Platino-Cyanide Wafers in Radiotherapeutic Measurements — Bordier and Galinard.
2. Indications for Radiotherapy — Dr. Haret.
3. Radioscopy and Radiography in the Detection of Foreign Bodies in the Digestive Tract — Th. Guilloz.
4. Interrupters for Low or High Frequency Currents and for X-Rays — Dr. Morin (of Nantes).

I. With some models of tubes those tablets are exposed, not only to X-rays, but, at the same time, to thermic radiations, and the latter being sufficient to modify the color of the salt, the salts are uncertain. Labouraud and Noire say that, with their radiometer, shade B, which corresponds to about 5 H., is accurate when the distance between the tablet and the anode is 8 centimeters, whatever may be the model or the diameter of the tube. The writers, following those directions, and exposing at the same time a Holzknecht wafer at 15 centimeters, have found that, when shade B was obtained, the quantity of X-rays varied from 4 or 5 H. to 3 H. or even much less according to the model of the tube.

When the distance between the tablet and the wall of the tube is sufficient, and when the tablet is placed below the tube, thermic radiations are practically eliminated, but if the tablet be placed

above the tube, hot air may play an important part.

Moreover, the diameter of the tube is most important. It is easy to understand that a tablet placed at 8 centimeters from the anode may be close to the wall of the tube or several centimeters away from said wall according to the diameter of the tube. Hence considerable variation in the intensity and action on the tablet by the heat radiations. Consequently, it would be most desirable that Labouraud and Noire should establish a scale of shades according to the diameters of X-ray tubes.

2. X-rays produce on the skin reactions which have all the characteristics of inflammatory lesions, from a simple depilation to the formation of an eschar, passing through the stages of erythema and vesication. The deleterious element, which was at one time thought to be ozone or electrical effluvia, has been proven by Kienbock to be the X-rays. The reaction, whatever may be its intensity, is always preceded by a period of incubation. The shorter the latent period, the more severe will be the reaction; 7 to 9 days in cases of eschars, 3 weeks in cases of simple depilation. Such effects are directly proportional to the quantity of rays absorbed. Oudin, Barthelemy, Darier have studied the histological lesions of these reactions; in marked cases alterations of blood vessels and nerves have been found. Scholtz has shown that all cellular elements are not equally sensitive to X-rays. The action on internal organs, eye, testicle, ovary, spleen, and bone-marrow, lymphatic follicles, is well known. X-rays have bactericidal properties only when a quantity far superior to what is enough to destroy tissues, is used.

In hypertrichosis, radiotherapy is really the best treatment, but in order to produce definitive alopecia, the dose of X-rays must be strong, and there is a risk of indelible scarring. In cases of trichophytinous infections, favus and

sycosis, radiotherapy is the method of election. Good results are obtained in acne, psoriasis, some forms of eczema, and tuberculides.

A slight X-ray reaction upon the scalp is useful in the treatment of alopecia. Pruritus and all diseases in which pruritus is a capital symptom, are benefited by X-rays, pruritus simplex, lichen planus, prurigo.

Keloids are amenable to X-rays. So are some sarcomas. Lymphosarcomas are generally much improved, and mycosis fungoides has found in radiotherapy its first real treatment. Warts, epidermic horns, cutaneous epitheliomas yield readily to radiotherapy. X-rays are specific against epitheliomas. Cancers of the lip, the tongue, and the breast are improved, but X-ray treatment must be combined with operation and used as a means of supplementing the latter. Deeply-situated cancers are less benefited. Cancers of the uterus and of the larynx have been treated with a special technique. Goiter seems to have been favorably influenced in some cases.

Oubertin and Beaujard have lately studied experimentally the influence of X-rays on leukaemia. Radiotherapy is the only method which has given so far seemingly permanent cures in the latter disease.

3. The question of the presence of a foreign body in the digestive tract is solved definitively in case of a positive finding by radioscopy or radiography. But a negative result does not allow us to affirm the absence of a foreign body; it may have been absorbed or eliminated, it may be too transparent, or, and this is the greatest hindrance in radiography, it may not have been stationary during the exposure.

Some bodies, fish-bones, pins or needles, for instance, are decidedly too small; some dental appliances are very hard to detect except by the metallic parts they may contain, especially when located in the œsophagus where their

shadows merge into the shadows of the spine or the aorta. Bones swallowed accidentally are generally very difficult to find.

In order to detect small pins or needles, it is necessary to explore systematically the shadow of the suspected region, by dividing said region into many parallel narrow strips. When a non-systematic search has proved fruitless, such a systematic process must always be resorted to.

The small dimensions of a very opaque body, such as a needle, are not the chief obstacle to radiographic detection. The main difficulty comes from the displacements due to respiratory movements and to the special movements of the digestive tract. A foreign body remains relatively fixed in the œsophagus except in case of deep respiratory movements; it remains stationary enough in the stomach and the large intestine, but may undergo considerable displacement in a short time in the small intestine. Consequently the time of exposure must be as short as possible, and if instantaneous could be reached, the result would be perfect. This is very hard to realize in radiography, but the writer has been able to do it once with a very good result in a case of accidental swallowing of a pin.

But, when this is not possible, our efforts must aim to reduce as much as possible, the displacements of the foreign body during the exposure.

The writer has often made such radiographs during a respiratory pause. Incidentally he states that pulmonary radiographs ought always to be taken during such a pause and preferably during a forced inspiration. Contrasts in the shadows of the picture are much more marked. If the operator has no apparatus giving a good plate after a fifteen seconds exposure, the difficulty may be gotten over by several successive exposures in the same condition, either inspiration or expiration; in the intervals

between pauses, the patient is allowed to breathe freely. Some little practice before the exposure is recommended so as to teach the patient how to get his diaphragm back to the same position. With such a technique, the writer believes pictures will always be better than with calm and quiet breathing.

But, if we can cope with respiratory movements, we cannot do the same with those of the digestive tract, particularly of the small intestine. Considerable difficulty is experienced here in simply detecting even a metallic body, ring, or coin, and considerable variety is found in the successive aspects and positions of the same body. On the difficulty of seeing in the small intestine a collodion bag filled with bismuth powder is based Licard and Imfroit's process of study of the digestive passage. The bag is readily seen in the stomach, and becomes visible again when it falls into the large intestine.

On account of these displacements, radioscopy is far more reliable than radiography for the detection of foreign bodies, especially in the small intestine.

To secure a criterion of a radiograph in cases of small bodies such as needles or pins, we may place on the other side of the screen a rectangle made of wire the diameter of which is less than that of the diameter of the body looked for. If such a wire be distinctly seen, negative results cannot be ascribed to bad fluoroscopic images. In adults and in fat patients, a very powerful tube is required, all the more because, in order to get a clear image, it is important that the tube should not be too near the patient. Rays must not be too hard nor too soft. Radiography is much easier in its technique than radioscopy, but its negative results cannot be accepted with the same security.

It is a good precaution to take several pictures at a few days interval. The average length of time a foreign body stays in the small intestine seems to be

two to four days. Considerable variation is shown in that respect by foreign bodies in the oesophagus, stomach, and especially large intestine.

The writer closes his article by general considerations on the nature of foreign bodies most usually found, and gives the points where X-ray examinations show them to be most frequently stopped. Coins form 45%, pins 22%, nails 7% of all foreign bodies in the digestive tract; bones 10%, fruit-stones 2%. The dangerous portion is the oesophagus. Below, there is not much danger. Nineteen times out of twenty, the foreign body is stopped at the crico-aortic stricture.

4. One of the interrupters is of the nature of a commutator and has a rotating shaft of indurated fibre with four metal contacts each of which occupies  $1/40$  of the circumference of the shaft. As this revolves it is pressed upon by three metal brushes and these may be adjusted to produce Leduc's current (galvanic), with one hundred interruptions a second and each contact lasting one thousandth of a second. Or the arrangement may be for an alternating current or for one in which the contacts form a larger or smaller fraction of each cycle.

His suggestion for a mercury dip interrupter is to have the mercury in a separate inner glass cylinder closed at the bottom by a layer of paraffin poured into the large jar and allowed to cool while the jar was tilted to one side. The mercury is introduced through a tube at the bottom and the cylinder containing it reaches only half way to the top of the alcohol or distilled water filling the outside jar. Another suggestion is to increase the steadiness of operation of a Caldwell interrupter by adding paraffin oil or vaseline oil so that drops of the oil will be widely scattered through the electrolyte. He mentions the case of a woman with a large uterine fibromyoma treated by condenser discharges rhythmi-

cally applied by means of the interrupter first described. The frequency was about 100 interruptions a second and in three or four seconds the tumor became entirely soft and relaxed. This condition lasted for three or four hours and recurred after subsequent treatment, but the effect was finally lost. The treatments prove of benefit in certain cases of muscular spasm.

#### ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, October 25, 1905.

1. Report upon Instruction in Medical Radiology — Dr. J. Belot.
2. Effect of the X-Ray and Radium Rays upon the Trypanosomes of Nagana — Drs. J. de Noebele and O. Goebel
3. A Case of Recurrent Ulcerative Cancer of the Breast — Dr. Mondain.
4. Liquid Volt Controller — Dr. Th. Nogier.
5. New X-Ray Tubes — Dr. Th. Guilloz.
6. Roentgenization — a Social Question — Drs. Laquerriere and Delherm.

1. The teaching of radiology is composed of three parts: theoretical, technical, clinical. The theoretical teaching relates the history of Roentgen's discovery and gives the necessary elements of physics. This part belongs more to physics than to medicine; it must be confined to the simplest necessary notions.

The technical part has more practical usefulness; it is best taught by direct manipulation of the apparatus.

The clinical part is the most important. X-Rays do not give a ready made diagnosis. It is easy enough to get radioscopic images or radiographs, but the interpretation is very often fraught with difficulty.

From the standpoint of physicians, the theoretical part is the least interesting; the technical part is more important, if the practitioner wants to be more than an automaton, and wishes not to be obliged to consult an expert every single

time a slight disturbance happens to the apparatus. The clinical part is the one that makes the true radiologist; it can be learned only by years of constant and assiduous work. It cannot be taught from a faculty's chair by a purely theoretical man; it must be taught by a practical physician and in a hospital.

The absolute minimum of knowledge necessary to a practitioner may be acquired in a relatively short time, say a few weeks; but it would be superfluous to add that such a short time can only give a minimum. Every medical student should have the benefit of a special course in radiology which might be taken at the end of the regular medical course, but would perhaps prove still more profitable if taken earlier, in connection with the study of anatomy and pathology. Radiology will certainly be popularized among practitioners and will become less and less a specialty. Radiodiagnosis is too intimately linked with every branch of medical science to remain confined in the hands of a few specialists. But such an evolution will take time and cannot go beyond a certain point.

The writer then describes in a few lines the official teaching of radiology as practiced in Berlin, Vienna, and Paris. He gives more space to the description of Professor Bergonie's service (Bordeaux). He emphasizes the capital importance of private laboratories and gives a complete description of the work in the service of Dr. Beclere, whose assistant he is.

2. Mense has proposed to employ X-Rays in the treatment of the sleeping sickness. The writers have investigated the action of X-Rays on some trypanosomes of the nagana, which cause a disease very similar to sleeping sickness.

On trypanosomes in guinea pig blood, a quantity of X-Rays equivalent to 12 H. have not caused a modification either in shape or motility. Radium, under similar circumstances, did not modify the shape, but the parasites were motionless

at the end of the exposure. The same results were obtained in parasites contained in guinea pig blood to which glucose or serum of dogs had been added, the two latter elements being very favorable to trypanosomes. X-Rays do not increase the trypanolytic powers of solutions. Consequently *in vitro*, X-Rays seem to be absolutely powerless against trypanosomes. Whether the same is true in the living subject, the authors propose to study later.

3. Dr. Mondain gives a continuation of the report of the case of ulcerated cancer of the breast he had reported as cured in August, 1903.

Recurrence in the early part of September. X-Ray treatment is resumed. In October, after X-Ray exposure, erythema, bronchitis, temperature  $102.5^{\circ}$ , quick pulse. The same phenomena reappeared after each radiographic application and actually became much worse after the fourth or fifth, notwithstanding all possible modifications an ingenious mind could devise to attenuate the irritating properties of the rays. At last, the patient gave up radiotherapy and began to consult all the quacks of the country.

The erythema and severe concomitant symptoms were not due to a radiodermatitis. The neighboring parts had always been very carefully protected by lead foil  $\frac{1}{8}$  of an inch thick, and two experts rejected the diagnosis of radiodermatitis. To explain such phenomena, we can admit, *a priori*, an infection or an auto-intoxication. The latter is more likely.

This case shows that a patient who has previously taken strong doses of X-Rays may later on develop without apparent cause a marked intolerance, even to weak doses.

4. Volt controllers are a desirable substitute for rheostats in using the electric lighting current for therapeutic purposes but they have certain serious inconveniences. This volt controller of

Nogier's is a circular one with a liquid conductor which enables one to obtain a current of from five to six milliamperes or all the way up to 200 or 300 ma. It consists of a circular trough of wood, a special porcelain dish being lodged in it. The two terminals are made of carbon and the liquid may be distilled water which will allow a current on short circuit of only 6 ma. With the ordinary drinking water of the City of Lyons a current of 60 ma. will flow. One can obtain a stronger current by adding a little acid to the water. Its cost is very slight. It can be used to measure very rapidly the resistance of various organic liquids, serum, urine, etc.

5. Guilloz has tried to find tubes for fluoroscopic and very rapid radiographic work which will permit of the employment of very strong currents and will work well on coils supplied by a Wehnelt interrupter. These are bianodic tubes with a large bulb and presenting the following peculiarities in regard to the anticathode and the regulator. The anticathode is made of chromium, a metal as infusible as platinum and which, not being volatile, does not blacken the tubes even when they are subjected to a very strong current. It requires, however, a more exact regulation of the equivalent resistance of a tube. Chromium can be platinized just like iron and so large heavy anticathodes can be constructed. Chromium being hard and brittle and difficult to work, it has been found best to reduce it to a powder which is then consolidated under very powerful hydraulic pressure. A piece of spongy platinum placed on the surface of the chromium before it is subjected to this heavy pressure enables one to obtain platinum-coated chromium anticathodes. These disks are sufficiently hard and resistant to take the place of the turned metal for the purpose. The regulator consists of two electrodes one or both made of a metallic hydride, such as barium or calcium, which readily gives

up a certain quantity of hydrogen gas under the influence of an electric spark. These two electrodes are placed in a side tube connecting with the X-Ray tube, and to reduce the vacuum a portion of the current is diverted so as to pass between these two electrodes. When the degree of vacuum has become too low in consequence of over-regulation, or of too strong a current, it can be raised again by running a comparatively weak current through it for quite a length of time. Sometimes this may require as much as even an hour or two, and with these tubes this does not produce blackening. The tubes are made by Drissler, Paris.

6. The writers summarize the action of X-Rays on the different organs of the body and dwell particularly on the influence on the genital system. Temporary sterilization is very easy with X-Rays, and the latter may be considered as a social danger. It is to be feared that unscrupulous practitioners will commit reprehensible acts under the cover of X-Ray examinations. This is one more reason why X-Rays ought to stay in purely medical, responsible hands.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE

Paris, France, July and August, 1905

1. New appliance for determining the degree of penetration of the X-Ray without exposure of the operator — Dr. Lacaille.
2. On urinary incontinence and its electrical treatment — Dr. Denis Courtade.
3. Electrization of the Intrinsic Muscles of the Eye — Dr. Chabry. Discussed by Dr. Oudin.
4. Local action of high frequency currents in Phlegmasic Conditions — Drs. Oudin and Bonneaux.

1. Dr. Lacaille's apparatus is simply a Benoist radiochromometer associated with a lunette of similar disposition to that used by Brandt in his posometer.

Such a lunette is formed of two parts: a box 6x8x10 centimeters and an eye-piece placed close to it at an angle of 45°. The box in his apparatus presents two interesting points; (1), on the bottom and placed at an angle of 45° is a mirror in which, when looking through the tube, one can see the inferior surface of the upper wall of the box; on said inferior surface is affixed a pasteboard disc covered with barium platino-cyanide; (2), on the superior surface of the same upper wall, exactly above the platino-cyanide disc, is the radiochromometer, the shade of which is projected by the X-Rays on the little screen, and reflected in the mirror. With such a disposition the operator is not directly exposed to X-Rays.

2. Only nervous incontinence is amenable to electricity. Such incontinence of urine is seen in organic (myelitis) or dynamic (neurasthenic) diseases of the nervous system. Cases of nervous incontinence may be classified in three groups:

First, incontinence with exaggerated vesical irritability, as seen in cases of medullary lesions increasing vesical tonus. As in incipient transverse myelitis, or in cases of very slight organic lesions of the urinary tract, lesions which would not be followed by any reaction in a normal individual, but which are enough to produce one in a neurasthenic subject; or again, in cases of reflex excitations, as in nephritis, renal calculi, anal fissures.

Second, urinary incontinence caused by an abnormal weakness of the internal sphincter. This is frequent in neurasthenics but may be seen also in cases of organic medullary lesions.

Third, incontinence merely psychopathic, without any lesion, as seen often in neurasthenic patients. Such incontinence may be primary, but is probably oftener secondary.

Electricity cannot improve cases in which there is a vesical lesion. In cases

of weakness of the sphincter, localized electrization of this muscle, either indirectly through the perineum or directly with Professor Guyon's olivary electrodes will prove successful. We should use chiefly faradic currents with a coil of thick wire, slow intermittences, and an easily tolerable intensity.

In neurasthenic patients, general treatment must come first. Local treatment must vary according to cases. Exaggerated vesical irritability will be benefited by continuous currents given with a large negative electrode on the dorsolumbar region and a double positive electrode, one on the perineum, and one on the hypogastrium, both being connected with the positive pole. We should use currents of from 20 to 30 milliamperes; and alternately increase and decrease their strength but without giving any shocks or reversing the direction.

We may also use a weak faradic current with a fine wire and quick intermittences, one pole being placed on the anterior abdominal wall and the other on the perineum. The latter mode of treatment modifies the reflex sensibility of the bladder and must be used in psychopathic cases. In cases of sphincteric atony, which is generally associated with vesical atony, the process indicated above for the treatment of urinary incontinence due to an organic nervous lesion, should be resorted to.

3. The writer has obtained very good results in two cases from the use of rhythmic faradization, the negative pole being on the eyelid at a point corresponding to the insertion of the muscle, and the indifferent positive pole on the nape of the neck. Diplopia diminished after three treatments and a permanent cure was obtained after ten. In one of these cases, a galvanic current had been previously used without result, and the application had always been exceedingly painful, causing great oculo-tension and vertigo.

Dr. Oudin says he uses an electrode

formed by an insulated rod and ending in a flat disk. Anesthesia is obtained by a single crystal of cocaine, and the electrode is applied directly to the insertion of the muscles. A continuous current rapidly becomes painful. A discharge from a condenser is perhaps the best source.

4. See THE ARCHIVES for December, 1905, page 311.

#### JOURNAL DE PHYSIOTHERAPIE

Paris, France, October 15, 1905

1. Physiological Effect of Hydrotherapy — Dr. Wybauw.
2. Treatment of Lupus by the New Methods — Drs. E. Jeanselme and Chatin.

1. Hydrotherapy aims to produce, through the application to the skin of water either warmer or colder than the said skin, local and general reflexes which may be used for therapeutic purposes. Hydrotherapy has close connections with thermotherapy. The water is only an agent used to convey the warmth but other elements might be used: air, mud, etc. The indifferent temperature varies with each one of the conveying agents.

Thermal hydrotherapy is influenced in its action not only by the temperature of the water, but also by the chemical composition of the latter and its special radioactivity.

The first effect of a hydrotherapeutic application, local or general, hot or cold, is a circulatory change. Cold water produces almost instantaneous vaso-constriction, followed soon after by intense vaso-dilatation. Warm water gives a vaso-constriction which often passes unnoticed, and afterward a very marked vaso-dilatation which, according to Winternitz, is accompanied by a loss in the vascular tonus and is somewhat like vascular paralysis, while the vaso-dilatation caused by cold water is an active dilatation without loss of tonus. This opinion is not shared by all authors, though all

agree on the different aspect of a vasodilation induced by cold or by hot water. These phenomena are independent of the central nervous system, and probably take place in the nervous plexus of the walls of the peripheric blood vessels. In the inner organs, inverse actions take place; a peripheral vaso-constriction corresponds to an internal vaso-dilatation and vice versa. Hydrotherapy is the only agent which can suddenly modify all the vascular activities of the body. Hence the good results, in infectious diseases, not so much through the mechanical lowering of the temperature as by the general stimulation of the vascular system, really a prophylactic treatment of cardio-vascular collapse.

Local cold applications over the precordial region have a tonic effect on the heart, somewhat similar to that of digitalis. After a temporary acceleration, the pulse becomes slower, and the contractions more powerful. Warm water quickens the pulsations.

It is generally agreed that cold hydrotherapy increases arterial pressure, and that warm water decreases it. But we ought to be very cautious in such assertions, because arterial pressure is the result of so many different factors that precise measurement is very delicate. With an identical work of the heart, a peripheral vaso-dilatation may increase or decrease arterial pressure according to the degree of compensation given or not given by a deep vaso-constriction. But the question is by no means as important as commonly thought. Cold hydrotherapy has been used by Winternitz in some arteriosclerous patients, and a decrease in the arterial pressure has been obtained after some time. Such a seemingly paradoxical result is probably accounted for by the increased elimination of toxic substances induced by hydrotherapy and a subsequent disappearance of the vascular spasm, which is probably of toxic origin.

The slowing of the heart, in cold hy-

drotherapy, is independent of the vascular reactions, and is produced simultaneously with the latter, by cutaneous reflexes. Cold hydrotherapy is the best method of increasing the tonus of the inhibitory nerves of the heart.

Cold hydrotherapy at first lowers the peripheral and increases the internal temperature. This is a consequence of the peripheral vaso-constriction, which as a whole, is only a protective reaction. If that cutaneous vaso-constriction is prevented by energetic frictions of the skin, the central temperature falls off immediately.

But, even when frictions are not used, the central temperature begins to decrease as soon as the cutaneous vaso-dilatation occurs, and decreases for a considerable time. When the minimum point has been reached, then the thermic reaction begins. The latter is due to all the processes resorted to by the organism in order to restore all bodily functions to the condition they were in before the application. This reaction requires an active organic effort.

Increase in bodily temperature depends on the circulatory functions which regulate the losses of heat, and also on the chemical functions of the body which regulate the production of heat. While the circulatory functions are stimulated at the time of the application, the chemical functions are stimulated a little later and they give rise to the secondary reaction. The organic combustions and exchanges are greatly increased after a hydrotherapeutic treatment.

A distinction must be made between the results of a single hydrotherapeutic application and those of a regular course. The latter induces secondary manifestations (increase in the number of blood corpuscles, for instance) which a single application is unable to give. This explains the good effects of hydrotherapy in nervous diseases, especially functional diseases in which the fundamental trouble is a disturbance of the chemical

activity of the cells.

The writer then gives a very brief list of the principal hydrotherapeutic processes, and insists on the fact that no special appliances are necessary and that every practitioner can always find a simple way of applying, even in private houses, the great majority of the usual hydrotherapeutic methods.

2. The first place must be given here to phototherapy. Finsen's apparatus has been but slightly modified since its appearance. In order to make the region permeable to actinic rays, we must produce a local anemia by means of a compressor. Several appliances have been devised to keep the compressor in place. But the hand alone can make an intelligent compression. Hence the necessity of having a nurse for each patient. The treatment lasts from one to two hours and causes a reaction which varies considerably according to the case. Treatments must not be taken more than once a week.

The photo-electrical reaction has been studied experimentally by Leredde and Pautrier. The erythema and the histological lesions caused by calorific rays are immediate, those caused by chemical rays are delayed in their appearance. Repeated reactions lead to sclerosis. The bactericidal action of phototherapy is still under discussion.

Finsen's apparatus is bulky and cumbersome. Diminutive models have been constructed, which give also a better utilization of the electric arc. Bang has used iron electrodes, traversed by a current of cold water, and has thus obtained a light almost without calorific rays but very rich in chemical rays. Broca and Chatin and Foveau de Courmelles have perfected Bang's device. The smaller apparatus are handy and not too expensive. But Finsen always contended that they were not powerful enough.

A good compression is a very important factor of success, but the best compression as we have already stated is al-

ways manual compression. Powerful lamps, long treatments, good compressions gave to Finsen 94% successes. Others have not been able to obtain as good statistics. But the percentage has never fallen below 50%.

Phototherapy succeeds best in small, well-outlined, young and yet untreated lupus, less than 2 inches in diameter. If larger, X-Ray therapy should be first resorted to in order to shorten the duration of treatment. If the surface is ulcerated, applications of potassium permanganate are useful before phototherapy is started on. Scarifications are very good adjuvants too. A young lupus is better influenced than an old and sclerous lupus. From the moment the treatment is decided, we must stand by the decision that has been taken. If phototherapy is considered only as a last resource to be tried when all other methods have proved unsuccessful, we are doomed to failure. In sclerous cases, the old methods are better than phototherapy. When a cutaneous lupus is only an extension of a lupus situated primarily on a mucous membrane, the results are very uncertain. Same when the lupus is accompanied by other tuberculous foci.

The esthetic results of phototherapy are very good. Phototherapy is far less painful than the old methods, but it requires a more elaborate installation.

Phototherapy is in most cases powerless against lupus erythematosus.

Certain substances such as erythrosin seem to make the skin more sensitive to phototherapy, but the question is not yet beyond the experimental stage.

X-Ray therapy may be applied in strong or mild doses. Beclere declares himself in favor of the latter method. The aim is to get the skin to absorb during each treatment the greatest quantity of X-Rays (4-5H) possibly without giving any radiodermatitis and to allow a sufficient interval (generally two weeks) between the treatments to protect the in-

tegrity of the skin. Most authors prefer the milder method.

Statistics are not as conclusive here as in the case of phototherapy. Some authors contend that X-Ray therapy is inferior to phototherapy in the treatment of lupus and that an apparent cure obtained by X-Rays must perforce be perfected by phototherapy. The extension of a lupus is the chief indication. Photo- and X-Ray therapy may be combined with the best of results. Strong doses of X-Rays are more efficient than any other method in the treatment of lupus erythematosus, but only on the fixed forms of the disease. The aberrant varieties are not improved.

Radium is the method of election for very small foci of lupus vulgaris. High frequency currents are useful in the treatment of lupus erythematosus. Electrolysis has but little place. But all these new methods must not make us forget the old methods which had by themselves a real value, and which are still very useful adjuvants.

#### LE RADIUM

Paris, France, October 15, 1905

1. A New Element, Radiothorium — Sir William Ramsay.
2. The Electrical Conductivity of Selenium — Eugene Bloch.
3. The Transformation of Dynamic Currents of High Tension into Static Discharges and Effleuves — Albert Charbonneau.
4. Vascularization of the Caecal Appendix; X-Ray Study of Injected Blood Vessels — Dr. E. Fraenkel.
5. Treatment of Hydrophobia by the Radiation from Radium — Prof. G. Tizzoni and G. Bongiovanni.

I. At the commencement of the year, 1904, Ramsay first made his observation upon this metal the emanation of which is identical with that of thorium. It has some of the general properties of thorium. Like the emanation

of thorium its radioactivity diminishes one-half in 55 seconds. It is richest in Beta rays. Placed under a phosphorescent screen preparations of radiothorium enveloped in paper give out emanations which rise into the air and which produce on the screen a sufficiently intense light. The radioactivity of radiothorium is measured by means of the electrometer. It takes twice as much radiothorium to charge an electroscope as it does of bromide of radium. It seems as if the radioactivity of thorium was due to the presence of a certain amount of this newly-discovered element, radiothorium. The radioactivity of the latter is half a million times that of thorium.

2. Bloch reviews the different forms under which selenium occurs and the various observations which have been made upon its electrical conductivity, its variation in resistance under the influence of light, temperature, and sound. The selenium cell furnishes a very delicate means of measurement of some of these forces by means of its variation in electrical conductivity. Unfortunately, it is subject to very serious variation from the effect of time and of temperature.

3. When an X-Ray tube is moderately hard, say of 8 to 10 centimeters spark equivalent, static phenomena are perceived, the conducting cords have a tendency to swing toward each other, the poles of the tube give out effleuves and the glass itself gives a breeze or even sparks if the hand is brought very near it. In carrying out his idea of producing static electricity from the induced current from a coil Charbonneau first placed the outer coats of two Leyden jars close to the bulb of an X-Ray tube, one near the cathode and the other near the anode stem, and connected the inner coatings with a spark-gap. On turning the current off every five seconds a 3-millimeter spark was obtained as a condenser discharge. If the current was allowed to run through the X-Ray tube for a considerable time the two con-

densers discharged at regular intervals.

In the second experiment the internal armatures of the Leyden jars were in relation with the walls of the tube and the external armatures with a spark-gap; by this means an 8-millimeter spark was obtained, or an effleuve 12 millimeters long between two little brooms. The brass balls were 3 centimeters in diameter and an 8-millimeter spark represented about 20,000 volts.

In a third experiment the current is taken from the poles of the X-Ray tube, a wire from the cathode passes to a capacity (like a brass ball) a wire goes from the anode to the earth and a wire from the earth, at the proper distance from the last, to the broom effleuve. The earth acts as a secondary condenser and the sparks are proportional to the distance between the two ground connections. With this particular connection and a primary current of 60 volts and 4 amperes, 1000 interruptions a minute, and 14 centimeters (Beclere's spintrometer) he obtained an effleuve 6 centimeters long.

Improvements upon this led to the adoption in his final experiment of two cylindrical vacuum tubes, long and narrow, with flat anodes and cathodes and each having an extra leading-in wire. The two latter are connected with an auxiliary spark-gap and dispose of the static charge on the glass walls of the tubes. The negative current of the coil goes to one pole of one tube, passes through its vacuum to its other pole thence by a wire to a capacity which rests upon an insulated platform. The positive current from the coil goes to one pole of the other tube, passes through its vacuum to the other pole and thence by a wire to the broom effleuve, the latter being held by an insulated handle. With this arrangement much longer effleuves were obtained and they had all the properties of the true static breeze or effleuve. They felt like a cool current of air, caused the characteristic sound

and attraction, and even the pulverization of liquids. They differed in all these respects from the effleuves of high frequency currents.

4. See this issue THE ARCHIVES, page 30, Abstract No. 1.

5. The authors have previously established that, *a*, radium radiations quickly decompose, *in vitro*, the rabic virus which loses all virulence after a two hours' exposure; *b*, they have produced the same effect in an animal previously injected with the same virus; *c*, such a result is constant whatever may be the primary focus of infection and whatever may be the distance between that focus and the place where the radium acts; *d*, this action takes place not only when the radium is applied at the same time the animal is infected, but may cure the animal at a later period, even when the symptoms of rabies are already evident; *e*, the effects are directly proportional to the intensity of the radioactive element and to the time of exposure; *f*, all other conditions unchanged, the application of radium on the eye is ten times more efficient than in any other place; *g*, no alteration of the eye is produced (the writers experimented with a weak radium); *h*, the virus when decomposed becomes an excellent antitoxin which gives immunity when injected into other animals.

Further experiments have confirmed the bactericidal power of radium, A=10,000 V. R., applied to the eye of animals inoculated with rabies. The emanation of radium was eliminated and the curative effects of radium cannot be attributed to them. In order to determine the curative power of the three kinds of radium rays, Alpha, Beta, and Gamma, the writers first used all three together; the animals did not present any symptoms and kept in perfect health. Then they eliminated the Alpha rays by means of a small aluminum screen. The animals survived long after the control animals. The disease was of a less se-

vere type in its manifestations, but the animals died on the 18th and 25th day. A third experiment was conducted with the Gamma rays alone, the Alpha and Beta rays having been deviated by means of a magnet. The animals died quickly.

Therefore, Gamma rays do not play any part in the protection against rabies: Alpha rays play a part, but much less important than Beta rays.

Recovery is possible not only if the treatment is applied at the onset of the disease, but even if it is resorted to at a much later period. But in the latter case the application of radium must necessarily be much longer. In some of the writers' experiments, an 18-hours application was necessary to cure the disease after a  $3\frac{1}{2}$ -days evolution, while eight hours were enough at the onset of the disease (Sample, 100,000 V. R.).

After an 8-hour application of radium to the eye, a section of the brain of the rabbit leaves an impression on a photographic plate; after four hours, it does not leave any trace. Now, an 8-hour application is efficient against rabies, a 4-hour application has no results. It follows therefore that the dose necessary to save an animal from rabies can be photographed and that the efficacy of the treatment is proportional to the radioactivity induced in the brain. There is a very close connection between the dose employed and the degree of radioactivity of the brain and the results of treatment. If 100,000 V. R., are enough to cure a rabbit weighing from 1200 to 1500 grammes, a radioactivity of from 4,000,000 to 6,000,000 V. R. would be required to have the same action on a man's brain. The authors deprecate any intervention on man with a wholly insufficient radioactive power, because one would thus simply discredit a method that may prove invaluable, if properly applied.

## FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRÄHLEN

Berlin, Germany, Vol. IX., No. 1

1. Concerning the Blood-Supply of the Vermiform Appendix — Eug. Fraenkel.
2. Bone Changes in Lepra Nervorum Shown in the Radiograph — Prof. Dr. Deycke Pascha.
3. The Demonstration of the Left Middle Heart Shadow Curve — Dr. A. Bittorf.
4. The Use of the Roentgen Ray in the study of Myxoedemæ — Prof. Virgilio Machado.
5. The Treatment of Gout and Rheumatism with the Roentgen Rays — Dr. Ernst Moser.
6. Perforating Aortic Aneurism in the Roentgenograph — Dr. Hans Arnsperger.

1. Fraenkel has made and published some beautiful radiographs demonstrating the circulation, or at least the blood-vessel supply of the vermiform appendix. He injected many preparations after the method of Beck, and made radiographs with the object of determining whether an infarct involving the appendicular artery or a branch of it might be a cause of inflammation of the appendix. His specimens demonstrate that the blood-supply is sufficient because of the extensive anastomosis even if a branch is cut off. In one specimen the lumen had been obliterated by a previous inflammation, yet the blood supply remained intact.

2. Deycke Pascha has studied 10 cases of lepra nervorum by means of the Roentgen ray and publishes the Roentgenographs. They demonstrate clearly the gradual absorption of the bones, and the deformities produced by it. The changes from a mere flexion of one of the phalangeal joints to a complete destruction of the bones of the foot are demonstrated. While in the extreme case the bony tissue has not been entirely absorbed it has been reduced to a conglomerate mass. From his investigations he concludes that the lepra bacillus

produces a substance which is a solvent for the lime salts, whether it be an acid or a ferment. This solvent action takes place particularly in the parts which have been deformed by the palsies and the contractures. The bone changes are brought about by circulatory disturbances.

3. Bittorf demonstrates the left middle heart shadow curve by placing the tube back of the patient and the plate or the screen in front with the anterior surface of the body turned  $\frac{1}{8}$  to the left. He concludes that the shadow is produced by an enlargement of the pulmonary artery or by an enlargement of the left auricle.

4. Machado has made some interesting studies of cases of myxoedema by means of the Roentgen ray. He finds in general that the ossification is very much delayed, while in rachitis, which is sometimes confused with it, the ossification is well advanced. The case, 19 years old, which he publishes, and the roentgenograph of the case show it to only have advanced to the fifth year of ossification.

5. Moser has treated and makes detailed reports upon seven cases of gout and twelve cases of rheumatism. In general the results have been most satisfactory. Other men have treated these diseases but with the one object of relieving the pain. Moser notes improvement in all of the symptoms, both local and general. He gives the following conclusions: (1) In gouty and rheumatic affections the Roentgen ray proves to be a remarkable remedy; (2) in gouty affections, especially in acute gout, the first treatments should be of short duration, about a minute; (3) rheumatic affections need mostly a longer exposure; (4) the effect of the rays is not only anodyne, but influences also the underlying diseases; (5) concerning the duration of the results, nothing can yet be said, but one case which he reported a year ago still remains well.

6. The case of perforating aneurism

of the aorta which Arnsperger reports came under his treatment and observation in 1899. Repeated radiographs and physical examinations were made. Repeated treatments by gelatin injections were given with improvement in the subjective symptoms but no changes in the actual findings. At his visit in the middle of March, 1903, the roentgenograph showed a secondary aneurismal sac developing from the main sac and projecting into the right lung. Fifteen days later the patient died from hemorrhage of the lungs, which was found to be due to perforation of this secondary sac.

## ZEITSCHRIFT FÜR ELEKTRO-THERAPIE

Leipzig, Germany, September, 1905

1. The Treatment of Lichen Ruber Planus by Means of Roentgen Rays — Leop. Freund and M. Oppenheim.
2. Investigations in Regard to the Bactericidal Effect of the Mercury Light — A. Keller.

1. The authors have treated one case of lichen ruber planus at Professor Finger's clinic in Vienna with the X-Rays and believe that under the influence of these rays the round cell infiltrations are changed into granulation tissue. This again forms true connective tissue and thus the reparatory changes in the epithelium go hand in hand.

2. Keller has made a great many painstaking experiments which will be welcomed as an important contribution to phototherapy. He used the "Uviol-Lamp" and the "Quartz-Mercury-Lamp." As is well known Hewitt constructed the first mercury lamp. The high price and the difficulty of its construction caused Dr. Schott to make a new ultra-violet mercury lamp, which he calls the Uviol-Lamp. The quartz-mercury lamp used by the author was different in construction. It is manufactured by the firm W. C. Heraeus of Hanau and a detailed description of it is given

in the article. Keller concludes as follows:

A. *Uviol-Lamp.*

First, this lamp has a certain superficial effect on bacterium coli communis and streptococcus pyogenes. Agar plates were placed at a distance of 7 cm. from the light. Bouillon cultures were not affected even after 2 hours exposure.

Second, the bactericidal effect of the Uviol rays was almost nothing when the agar plates were covered with a glass cover.

Third, on the sensitized agar plates (eosine 1:1000) the bactericidal effect was more marked than on the non-sensitized ones.

Fourth, on white mice the Uviol rays proved to be very pernicious. On all animals a necrosis of the ears and tail-

ends was noticed.

B. *The Quartz-Mercury Lamp.*

First, the effect of these rays on bact. coli comm. and streptococcus pyog. was seen much quicker than with the Uviol rays. Distance 7 to 12 cm.

Second, when the agar plates were covered with a piece of glass the effect again was almost *nil*. When, however, instead of glass a piece of quartz was used an effect was apparent, although not as strong as on the uncovered plate.

Third, agar plates colored with eosine did not show the same difference as in the experiments with Uviol rays.

Fourth, white mice were not so much affected as in the former experiments. Two guinea pigs exposed for six hours did not show any signs of disease whatsoever.

## ELECTROTHERAPY

### A PLEA FOR THE MORE GENERAL USE OF ELECTRO-THERAPEUTICS

Amedee Granger, *New Orleans Medical and Surgical Journal*, November, 1905

Two very generally entertained but erroneous impressions regarding electro-therapy are, (1) that it is of value but requires such an outfit and such an amount of special training that it is not a method for the general practitioner but for the specialist; (2) that it is of very doubtful efficiency and that its action is mainly psychical.

"Both views are incorrect. Because one has a knowledge of the primary branches of medicine, does it follow that without study or instruction he knows gynecology and surgery? Why should it be different with electro-therapeutics? Therefore, because one is an M. D. he should not hope without previous study or training to duplicate results with a static machine or wall plate which he has

just purchased; and because he fails he certainly has no right to doubt that such results can and have been obtained.

"Electro-therapeutics is no more a specialty than gynecology, strictly speaking. Every physician does some gynecology, and with good results, only referring patients to a confrere who is better equipped, has superior facilities and a wider experience when the nature of the case demands it. So it is with electro-therapeutics. Any general practitioner who will devote to this subject the same amount of time and study which he does to gynecology or surgery, and who has a good static machine and wall plate, is perfectly competent to treat the large majority of cases requiring electrical treatment. The outlay is not great and when properly employed the results will not only be gratifying to himself, but to his patients also."

Granger has used the electrical current with most gratifying results in many diseases but mentions particularly consti-

pation, neurasthenia, and dysmenorrhea.

His technique in the first-mentioned consists in laying the patient recumbent on a couch or operating table, and placing one pad at least 7 by 11 inches, thoroughly wetted and soaped, over the abdomen and another of like dimensions under the lumbar spine. The combined galvanic and faradic currents, the latter from the long, fine-wire coil are thus made to traverse the whole intestinal mass, the positive pole being connected to the abdominal pad and the negative to the dorsal pad. The intensity of the galvanic current should be between 50 and 100 ma., and the duration of the application should be from 20 to 30 minutes. He considers that the combination of these two currents gives better results than can be obtained by the use of any other one alone.

The rationale of the current in this situation is elucidated by its ascertained physiological effects which are that (1) the galvanic current causes contraction of the intestines; (2) that this contraction is greatest at the positive pole; (3) that it lasts during the whole time of the application, disappearing shortly after the current ceases to pass, and that the induced or faradic current causes contractions of both the circular and longitudinal fibres of the intestines; (4) that these contractions are more active when the current is derived from a long, fine-wire coil. Bordier and Clazet have also proved that if the faradic current, when used in galvano-faradization, is obtained from a short coarse wire coil the stimulation of the unstriped muscular fibre is not as great as if the induced current from a long fine-wire coil is used alone.

Cures are effected in from four to six weeks, the treatments being administered daily at first, and after normal daily movements of the bowels have been established, three times a week and later twice a week. His cures have persisted so far for from periods of six months to one year without recurrence. Both

these results were obtained without dietetic regulation yet he believes that such regulation would make the cure more rapid and recommends it.

He speaks well of the use of the static current in neurasthenia but does not detail his technique. Several cases have been cured and so far the results are permanent.

He limits his discussion of the treatment of dysmenorrhea to that form which appears in young girls in whom no recognizable pelvic disease is present. It is associated with a neurotic constitution, vaso-motor disturbances, and habitual constipation. Technique in these cases consists of percutaneous abdomino-dorsal applications of the continuous current, one large pad being placed over the lower abdomen and another under the back, the current to be turned on very gradually and varying in strength from 10 to 60 ma. according to the demands of the individual patient. Applications are made daily or three times a week beginning, preferably, about one week before the expected menstrual period. During the menstrual period they are discontinued to be resumed again during the inter-menstrual epoch. It is rarely necessary, even in cases of long standing and where pain is severe, to continue the treatment more than two months. In exceptional cases which resist this treatment the application should be made with one of the electrodes in the vagina or even sometimes in the uterus. A case is reported to illustrate the efficiency of the treatment and the patient has remained well for six months at the date of the report.

#### TREATMENT OF URETHRAL STRICTURES

August Ravogli, *American Journal of Dermatology*, November, 1905

Ravogli does not believe in divulsion of urethral strictures and considers that the passing of sounds is effective in dilating them through its massage effect

whereby the deeper tissues are stimulated so as to cause absorption of the cicatrix. He prefers the dilator of Kollmann which consists of four blades opening in different directions. When it is closed it is not any larger than an ordinary sound hence may be introduced easily. Regarding the use of electricity he says:

"In the treatment of these strictures we have found very satisfactory the application of electrolysis, which we have used for many years. Our views are in accordance with those expressed by Edward Lang, that in the strictures of high grade narrowness electrolysis is the only practical method. In our experience we in this way sometimes accomplish in a sitting as much as we could have obtained otherwise in weeks.

"In the same way Mansell Moullin claims that in narrow cicatricial strictures a current of 10 to 12 ma. has made the scar soft, the surface moist, producing redness, and has caused the tissues to become capable of distension. Indeed, after an application of electrolysis another sound can be easily introduced. The action of the weak currents consists in the production of a serous exudation through the tissues, causing a real decomposition of their structure by removing the hydrogen with the kathode. By using strong currents, however, there is produced mortification and cauterization of the tissues. For ordinary work we use a current from 12 to 20 ma., which, in cases of hard callous stricture, can even be intensified.

"The electrolytic sound is kept at the place of the stricture by pushing it gradually and gently forwards; after a short time it is noticed that it advances and the stricture is passed. When the sound has passed the stricture then we withdraw it, after letting it remain for about a minute at the strictured point. The pain accompanying this operation is so insignificant that there is no necessity for the local use of cocaine. The reaction is somewhat higher than that which fol-

lows the introduction of an ordinary sound.

"In some cases the result is only the softening of the stricture, and consequently the treatment with sounds must be continued until we are sure that the stricture will stay cured."

### EXOPHTHALMIC GOITRE AND ITS TREATMENT

George R. Murray, *London Lancet*, November 11, 1905

Murray refers to the use of electricity and X-Rays in the treatment of exophthalmic goitre as follows:

"One of the most valuable means of treatment of Graves's disease is undoubtedly the systematic application of a faradic current. This treatment, which may be employed alone or along with medicinal treatment, should be carried out wherever possible, as in my cases the best results have been obtained with patients who have persevered with it. The most satisfactory method of applying the current is that suggested by Sir Victor Horsley. Two flexible electrodes, about four inches long and two inches wide, covered with flannel or wash-leather, and moistened with a warm salt solution; one is applied in front over the goitre, and the other at the back of the neck. These electrodes are fitted with straps and buckles at the sides by means of which they are fixed in position. They are then connected with the secondary circuit of a dry cell faradic battery, a water rheostat being included in the circuit so that the strength of the current can be regulated as desired. The current should be just strong enough to produce a prickling sensation in the skin but not so strong as to be unpleasant. The current should be applied in this manner for an hour twice in the day and in some cases it may be applied for as much as three or four hours in the day. A patient very quickly learns how to

apply the current herself. This treatment can be carried out easily in the case of private patients and in a hospital, but it is unfortunately not adapted for hospital out-patient practice in which so many of these cases are seen. The drawbacks are the time and trouble it entails, so that steady perseverance on the part of the patient is essential. I have observed steady improvement and practical recovery take place in several cases in which this treatment has been systematically carried out.

#### X-Rays

"The remarkable effect X-Rays have been found to possess in bringing about a reduction in the size of an enlarged spleen in cases of spleno-medullary leukaemia has suggested that they might be of service in the treatment of exophthalmic goitre. In one of my cases in which this treatment was adopted no benefit was derived, indeed, the symptoms were somewhat aggravated, and so it was discontinued. Beck, after excision of one lobe of the enlarged thyroid, exposed the other lobe to X-Rays. In two cases in which this treatment was carried out, in one 18 and in the other 3 months after the operation, which had only produced an improvement, a remarkable diminution in the nervousness and tachycardia was observed. In a third severe case, in which the X-Ray treatment was started a week after the operation, by a daily exposure of at first five and then ten minutes, the improvement was immediate and rapid. At the end of a week the treatment was suspended for a week, when it was found that the pulse had fallen from 160 or 180 before the operation to 80, and the exophthalmos had nearly disappeared. After that the X-Ray treatment was given for five minutes each week. When seen five months after the operation the remaining half of the goitre had disappeared as had also the exophthalmos and tachycardia. It

is, however, difficult to determine whether this satisfactory result is to be attributed to the operation or to the X-Rays, or to both. Dr. Stegmann treated two cases of Graves's disease by X-Rays with marked success, each sitting occupying 15 minutes. The nervous and cardiac symptoms disappeared though the size of the goitre remained much the same. These results suggest that a further trial of X-Ray treatment should be made."

#### SOME CASES OF NEPHRITIS TREATED BY ELECTRICITY

Ethel Edgerton Hurd, *North American Journal of Homeopathy*, November, 1905

Dr. Hurd reports five cases of nephritis of various degrees of severity and chronicity, all of which recovered entirely under applications of electricity. She relies mainly upon half an hour's positive insulation of the patient, sometimes supplemented or substituted by the wave current applied through a positive electrode located over the kidneys. She also sometimes uses the high frequency current from an Oudin resonator excited by a 15-inch Heinze coil, in the form of auto-condensation. She makes the patient's idiosyncrasy her guide as to which of these modalities she shall apply but does not define the significance or characters of the idiosyncrasies.

She protests against the use of too strong a static current, believing that harm often results therefrom; her choice is for a 6 plate static machine. She also protests against using a vacuum glass electrode connected directly with a static machine by which some men get what they allege to be a "high frequency" current. She has seen patients whose backs were blistered and scabbed by the application of the static current from the vacuum electrode so connected.

## RADIOTHERAPY

## THE ADJUSTMENT OF X-RADIATIONS FOR VARIOUS PHYSIOLOGICAL EFFECTS

Russell H. Boggs, *St. Louis Medical Review*,  
November 11, 1905

Boggs believes that there is a difference in the physiological actions of rays of a low and high degree of penetration, and uses tubes giving rays of 5 different degrees of penetration for the treatment of different conditions. These degrees are as follows:

"No. 1, the tube being so low that the cathode stream can be plainly seen, and this tube will not fluoresce beyond six or eight inches.

"No. 2, with the cathode stream scarcely visible, but there is a bluish areola around the cathode.

"No. 3, is a tube which does not show any of the cathode stream and will back up between  $\frac{1}{2}$  and  $1\frac{1}{2}$  inch parallel spark gap and, with two ma. going through a tube and small spark gap at each side, will penetrate the chest of a patient weighing from 100 to 125 pounds and show the ribs very black. If 10 or 15 ma. pass through this same tube, an excellent picture will be made.

"No. 4, is a tube which will pass  $\frac{1}{2}$  milliampere of current and the light will penetrate a patient's chest of almost any size, but the bones will appear grayish white on the screen.

"No. 5, is a tube in which the light is very unsteady and the amount of current passing through the tube is scarcely noticeable by the reading of the milliammeter. There is little use for this tube in a laboratory, because the quantity of radiation given off is very small, and these rays are too penetrating for most conditions."

These tubes are used respectively to treat diseases of which the following are types:

"Tube No. 1 might be an acne tube and is suitable for nearly all the skin lesions which are not ulcerated.

"Tube No. 2, for the treatment of epithelioma and lupus.

"Tube No. 3, for the treatment of cancer of the breast, tuberculous glands, etc.

"Tube No. 4, for the treatment of sarcoma."

He uses the lowest tube for the treatment of skin diseases because in this class a rich chemical light is desired which will not possess enough penetration to act on the muscles of subcutaneous tissues. In rays No. 1 nearly all the radiance is absorbed by the skin. Sarcomatous tissue is more opaque to the X-Ray than carcinomatous and much more resistant to the destructive action of the ray than the epithelial cells, for which reason he recommends No. 4 for sarcoma and No. 3 for carcinoma.

"If it takes 100 units of X-Ray to destroy normal tissue, it will take 50% to burn sarcoma, and about 25% to burn cancerous tissue." This explains why malignant tissue can be destroyed without injuring the healthy tissue. Cancer spreads by the lymphatic glands and the reason why applications of the X-Ray will inhibit the spread of a cancer is because lymphatic glands are very susceptible to the action of the X-Ray, become smaller and harder and degenerate under its influence, whereby they are surrounded more or less completely by fibrous tissue which walls off the glands and checks extension of the disease.

(1) He considers that a differential selection of X-Radiance as regards penetrative power with regard to the location and character of the pathological processes to be treated, is necessary in order that the best therapeutic results may be secured; (2), that epithelial cells are destroyed by small doses of X-Radiance

while the same amount of rays would stimulate connective tissue cells; (3), that the distance of the tube from the lesion is an important factor in the treatment of both deep and superficial diseases.

He recommends when treating deeply-located pathological processes to follow the rule recommended by Williams, namely to place the tube so far away from the skin that the influence exerted upon it will vary but little from that exerted upon the deeper tissues; in other words vary the distance as the intensity of the rays varies, that is, inversely proportional to the square of the distance.

#### SOME PRACTICAL POINTS IN X-RAY THERAPY

A. L. Grey, *The Virginia Medical Semi-Monthly*, October 27, 1905

Grey considers that many of the failures to secure satisfactory therapeutic results with the X-Ray are due to a lack of reparative or recuperative power in the patients, and insufficiently vigorous administration of the ray. Surgery appeals to the patient because the results are much quicker and less expensive but as a rule the fact that cancers recur so frequently after surgical extirpation would justify the conclusion that it would be better for the patient to spend more time and more money on his case and to secure a result in which the probability of recurrence was so much less than after radical extirpation.

He has treated three cases of lupus vulgaris with prompt success in each case and expresses surprise at the pessimistic views expressed by some specialists as to the efficacy of the ray in this trouble. He also speaks favorably of the use of the X-Ray in psoriasis, eczema, and keloids.

A case of lymphatic leukemia is reported as follows:

"On beginning the treatment (January 14, 1905) the blood examination, made a few days previously, showed leucocytes 140,000; lymphocytes, 90%;

January 27th, number of treatments, 4, leucocytes 45,000 per cubic millimeter; February 6th, number of treatments, 4, leucocytes 25,000 per c. mm.; February 16th, number of treatments 5, leucocytes 16,000 per c. mm.; February 23d, number of treatments 4, leucocytes 15,000 per c. mm.; March 2d, number of treatments 4, leucocytes 10,000; total number of treatments, 21. Patient's spleen was reduced from the size of a breakfast plate to nearly normal. Along with the improvement in the blood count there was a general improvement in his physical condition. On beginning treatment he could scarcely stand, had no desire for food and suffered with constant nausea. He had fissures in the margin of each nostril, in the nasal septum and also in the anal margin. These entirely healed and when he left, on account of business affairs at home, he was able to walk wherever he wished and was eating heartily. This man died about May 1st with what was diagnosed as acute tuberculosis."

Grey believes that an appropriate and skillful technique will enable us to effect satisfactory therapeutic results with the X-Ray even in deeply-located malignant processes.

#### X-RAYS IN THE TREATMENT OF CANCER

Chisholm Williams, *London Lancet*, November 4, 1905

Williams considers that many of the failures to secure satisfactory therapeutic results in the X-Ray treatment of cancer have been due to the fact that untrustworthy apparatus has been employed and that only the hopelessly inoperable cases have been sent to the X-Ray practitioner, failure of the patients to persevere in the treatments because of the improvement in their general conditions, and a too energetic application of the ray whereby the surrounding healthy parts are exhausted and ultimately deprived of their physiological resistance

instead of being stimulated to resist the invasion.

He does not believe in shielding the surrounding area in most cases as such procedure would prevent the rays from reaching the remote parts that may be infected. He does, however, believe in applying the rays several weeks before operation in those cases where operation is deemed advisable. Even healthy wounds heal more rapidly under judiciously-applied X-Rays, hence there need be no hesitation in applying the rays after operation. A cure can be *promised* only in small superficial growths but a variable measure of alleviation can almost always be expected in all growths.

He reports ten cases of malignant disease which he has treated, and which have completely disappeared, affecting the breast, soft tissues over the temple, the lip, the inside of the cheek, external parotid region, the rectum, and the throat. The breast cases were all recurrences, some of them involving extensive areas. Microscopical examination demonstrated the diagnosis in each case. Most of the patients had been under the observation of other men beside Dr. Williams before their treatment, during the course of it, and afterward. The case of cancer of the rectum is so striking an illustration of the curative power of the X-Ray that we extract in full as follows:

"The patient was a man, aged 59 years (sent by Dr. H. Roxburgh Fuller). He was suffering from a very extensive growth of the rectum and anus which he had had for some 18 months and which had been diagnosed as a carcinoma by Sir Frederick Treves and Mr. Anthony A. Bowlby. He was advised not to undergo an operation owing to the extensiveness of the growth. The examining finger could not reach beyond the hard masses in the rectum. Outside there was a horseshoe-shaped mass at the anal site; this was  $3\frac{1}{4}$  inches across by 4 inches long and projecting  $1\frac{1}{8}$  inches above the surrounding skin. A very slight trace

of anus could be detected at the lower part. The growth, though fairly hard, bled very readily to the touch. Microscopically it was a carcinoma with much fibroid tissue. The patient suffered from incontinence of faeces and had done so for over a year; he also had much pain and discomfort. He was compelled to eat his meals in a standing position. The treatment which I administered was from a high-frequency electrode giving off X-Rays for an area of the size of a five-shilling piece which showed the terminal phalanges of the fingers well with the fluorescent screen. The applications were each of 20 minutes' duration from three to five times weekly and extended from June to November, 1903. A peculiar feature was the almost immediate production of an enormous flow of clear mucous discharge which only ceased towards the end of the treatment, when the original tumor consisted of a hard, fibrous, horseshoe-shaped lump but only of the thickness of one's little finger. The incontinence had ceased and there was no pain to the examining finger which could easily get above the growth, the remains of which seemed to be limited to the sphincter alone and consisted of very hard tissue. The natural opening was considerably contracted. Colostomy was subsequently performed, the growth remaining arrested. There has been no recurrence."

#### A CASE OF ADVANCED MAMMARY CANCER TREATED BY A COMBINATION OF OPERATIONS AND THE X-RAY

A. Marmaduke Shield and H. Lewis Jones,  
*London Lancet*, November 18, 1905

The patient was a woman 46 years of age who was referred to Mr. Shield by Mr. E. E. Bronstorph in July, 1904, for the removal of a tumor in the right breast which had been steadily increasing in size for twelve months. The usual characteristics of advanced hard carcinoma

were manifest, the skin being involved and the nipple deeply retracted; the axillary glands were also enlarged. The breast, axillary lymphatic glands and lower portion of the pectoral muscles were removed and rapid and steady healing ensued.

In the following November, however, recurrence took place in the form of numerous nodules in the scar varying in size from that of a pea to that of an almond. These were also scattered about the intercostal spaces in various directions. Between November 11, 1904, and March 22, 1905, three successive operations were performed for the removal of successively recurring nodules but they continued to appear and on April 11th X-Ray treatment was begun by Dr. H. Lewis Jones.

For two months X-Ray applications of 12 minutes' duration, tubes used being soft or of a medium hardness and the current used varying between  $5/10$  and  $8/10$  of a milliampere (in secondary circuit?) were applied, and five grains of the hydrochlorate of quinine were given on the morning of the days upon which the X-Rays were to be applied. After that X-Ray treatments were given once a week for a period, the duration of which is not stated, which resulted in complete disappearance of the malignant trouble. No screening of the surrounding parts was practiced beyond protection of the face and parts of the arm and forearm.

Mr. Shield examined the patient on October 17th. She was looking perfectly well, had put on flesh and was able to walk five or six miles without fatigue. The local and general signs of carcinoma had entirely disappeared and she appeared to be in a condition of perfect health. Shield considers that this case teaches us not to assume hurriedly that recurrent cancer is hopeless but to avail ourselves of all known reputable methods, one of the most remarkable and efficient of which he considers to be the X-Rays.

## THE INFLUENCE OF THE ROENTGEN RAYS ON LEUKEMIA

Dr. M. Franke-Wien, *Klin. Woch.*, No. 33, 1905

Franke has employed the following technique: Hard tubes in order to secure a deep effect of the rays and to spare the skin. Duration of radiation 8 minutes, distance of tube from skin 22 to 25 cm. (9 to 10 inches). Two seances per week if the condition of the skin permitted.

**Case I.** Woman, 47 years old, was in hospital from January 3 to April 1, 1905. The disease commenced a year previous to admission when patient felt pains in the left side of the abdomen and in the back when she worked hard. Somewhat later pains in the feet and general debility. Four months ago patient herself noticed a growth in the left side of the abdomen.

**Status praesens.** Skin and mucous membranes pale, lungs normal, heart not enlarged, anemic murmurs. Tumor of the spleen reaching, in the middle axillary line, from the eighth rib to the anterior superior iliac spine, in the median line down to about two inches above the symphysis pubis, and to the right a little over the median line. Consistency moderately hard, sensitive to pressure. Blood count on February 5: 3,600,000 erythrocytes, 311,000 leucocytes, among the latter 19% myelocytes. Diagnosis: myelogenous leucæmia.

Treatment with Roentgen rays was begun February 13, 1905, the spleen only being radiated. Ten treatments were given, the total exposures amounting to 80 minutes with the following results:

(1). Rapid and steady decrease of the white blood corpuscles, within six weeks the number sinking from 300,000 to 6,550. The percentage of the different forms of leucocytes became almost normal at the end of the treatment; the myelocytes sank from 19% to 0.7%.

(2). The number of erythrocytes

increased from 3,600,000 to 4,570,000.

(3). The size of the spleen slowly but steadily decreased and at the end of the treatment reached only five finger-breadths below the ribs.

(4). The tenderness of the bones disappeared.

(5). General health improved, patient gained four pounds, appetite improved. The slight fever which was present at first disappeared.

**Case II.** Woman, 37 years old, under treatment from October 20, 1904, to April 3, 1905. Patient was never sick before present disease began in December, 1903. About a week after giving birth to a healthy child she noticed a tumor in the left side of the abdomen below the arc of the ribs, pain and general weakness, her appetite failed and she lost weight. The last few weeks before she entered the hospital the pains in the abdomen increased. Severe diarrhea, cough and frequent epistaxis confined her to the bed. Menses absent since December, 1903.

**Status praesens.** Skin and mucous membranes very pale, panniculus adiposus nearly gone. Weight 37 Kg. (about 81 pounds). The heart dilated to the right, pulse 100. The tumor of the spleen reaches in the middle axillary line down to the anterior superior iliac spine, in the median line to the symphysis pubis and toward the right as far as the middle line. Spleen moderately hard, lymphatic glands slightly enlarged, sternum, tibiae, tender upon pressure. Urine shows Ehrlich's diazo reaction. Temp.  $38.3^{\circ}$  C.

The treatment with Roentgen rays was begun November 28, 1904. Sixteen radiations totalling 128 minutes were given. At first the spleen was radiated nine times and then the blood showing no change, liver, spleen and bones were radiated simultaneously. The number of leucocytes, before treatment 342,500 (November 26), sank gradually to 63,000 (February 25), and was 168,000

when patient left the hospital. The number of erythrocytes increased from 3,570,000 to 4,900,000 (December 11) and was 4,000,000 at the last count. The general health improved, she gained 11.7 Kg. (26 pounds), the spleen became smaller, epistaxis and the diazo reaction in the urine disappeared. But from March on the course of the disease was less favorable; in spite of the continued Roentgenization the spleen grew larger, appetite decreased, diarrhea and epistaxis reappeared. Weight sank to 47 Kg.

In this condition patient left the hospital.

**Case III.** Man, 37 years old, in hospital from December 2, 1904, to February 23, 1905. Present disease said to have commenced in March, 1904, he had pains in the left side of the abdomen and noticed the gradual development of a tumor below the arc of the ribs.

**Status praesens.** An enormous tumor of the spleen reaching in the left middle axillary line from the seventh rib to the anterior superior iliac spine, in the mamillary line to Poupart's ligament, in the middle line to the symphysis pubis, to the right passing the middle line four fingers' breadths. Spleen hard, liver in right mamillary line two fingers' breadths below the arc of the ribs. Lymphatic glands not enlarged, bones tender on pressure. Typical myelogenous leucæmia. Roentgen treatment begun December 10, 1904, patient being radiated 12 times totalling 96 minutes.

The number of leucocytes slowly decreased. The number of erythrocytes increased, spleen gradually became considerably smaller. Patient felt better and gained two pounds.

But 10 days after the last radiation, on October 2, 1905, œdema appeared in the face, on the lower extremities and on the whole body, and the urine showed the symptoms of an acute nephritis. Edema disappeared within two weeks, the leucocytes also decreased during this

time and spleen became still smaller. Patient left on February 23.

March 13, 1903 (ambulant); number of leucocytes increased to 151,000, spleen larger, more albumen in urine, subjectively feels well.

March 27, 1905 (ambulant); spleen larger, leucocytes 91,000, less albumen, sternum tender to pressure.

May 17, 1905 (ambulant); 208,000 leucocytes, 16.9% myelocytes. Spleen as large as before the Roentgen treatment. Patient is weaker.

**Case IV.** Man with myelogenous leucæmia, was radiated four times over the spleen. Number of leucocytes decreased from 460,000 to 220,000; slight decrease of the size of the spleen; improvement of the general condition; relief of pain in bones.

The author comes to the conclusion that we should not speak of a "cure" of leukemia with Roentgen rays. The results are remissions, perhaps a return to the "stadium aleucæmicum" of leukemia. These remissions may extend over a shorter or longer time—up to four years, as in Schutz's case—so that *the Roentgen treatment is indicated in every case.*

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#### THE TREATMENT OF LEUCAEMIA AND PSEUDOULEUCAEMIA BY THE ROENTGEN RAYS, WITH REPORTS OF CASES

Arthur Holding, M.D., and Mortimer Warren, M.D., *N. Y. Med. Jour.*, and *Philad. Med. Jour.*, November 11, 1905

From a study of current literature on this subject it is found that 25 cases of splenomyelogenous leucæmia have been treated by X-rays, 32% of which have been symptomatically cured, 60% improved, and 8% unimproved or fatal; 8 cases of lymphatic leucæmia have been treated of which 37% were improved and 63% were unimproved or fatal; 22 cases of pseudoleucæmia have been so treated of which 27% were symptomatically cured, 59% improved, and 14% unim-

proved or fatal.

Although the number of cases are too few to be conclusive, yet these figures are remarkable in diseases recovery from which has only been rare and occasional. Although it may be objected that spontaneous recession of the pathological changes may occur in some cases, yet it is highly improbable that spontaneous recession would occur, coincidentally with the beginning of the X-ray treatment, in 45 cases occurring in different parts of the world and under different operators, as has been the case in this disease. Furthermore, no case in this series has been classified as apparently cured unless the myelocytes had disappeared from the blood and the splenic or lymphatic tumors had diminished or disappeared, and these conditions had existed for some months without treatment, the patient being alive and in good condition at the time of the report. While in several cases the myelocytes disappeared from the blood in very few has the spleen resumed its normal size. This latter may be accounted for by the probability of excessive connective tissue being present.

The technique used consists of applying the light over the spleen, the enlarged glands, chest, knees, and elbows. The X-ray tube must be excited so as to give a light which will penetrate the diseased organs. A low vacuum tube which expends its energy upon the skin is not to be recommended.

It has also been observed that once a case has improved under X-rays, if the rays are discontinued the pathological features again become prominent and usually again disappear when the rays are resumed.

One case of pseudoleucæmia and one of splenomyelogenous leucæmia, treated by authors, are reported in which reduction of the number of leucocytes, increase in the haemoglobin percentage and red blood corpuscles, and improvement in the patient's general condition, as well

as in the characteristic symptoms of the disease, took place, and the various changes observed in the blood and its constituent elements are very carefully and exhaustively noted.

The authors conclude that the X-rays have a marked influence upon the lymphatic system and blood-making organs, that their palliative action in cases of leucæmia and pseudoleucæmia is demonstrated, and suggest that in some cases curative effects may be hoped for; they recommend further observation of the action of the rays in this class of diseases.

### THE "LIGHT TREATMENT" OF LUPUS VULGARIS

Malcolm A. Morris, *London Lancet*, October 28, 1905

Morris considers the treatment of lupus by the Finsen Light. He regrets that much work has been done with cheap and inefficient imitations of the Finsen apparatus and believes Reyn's modification to be the only apparatus aside from the original that possesses any value. He has discarded the London modification of the Lortet-Genoud lamp as practically useless, since its light does not penetrate deeply.

He has treated lupus vulgaris for five and one-half years by Finsen's method, employing it in cases of every type and severity, but he does not regard it as the only method to be used to the exclusion of all others; on the whole the results are superior to those which he has been able to obtain in twenty-five years' practice by other methods. In a few cases it has failed to effect a thorough cure and in some cases the results are not permanent.

There are some cases which he considers incurable by any means; radium, Finsen light and X-rays all fail to cause more than a temporary disappearance.

These cases may be small in extent, yet they resist all the measures employed for their relief. In some cases of lupus, where the disease is limited to a small patch and is superficial, Finsen's method is decidedly superior and is not followed by the local hypervascularity which often follows treatment by X-rays.

Recurrences may be treated indefinitely without injury. If the disease is rapidly spreading X-rays should be used first and the treatment concluded by Finsen's method, but where there are but a few scattered patches the light is sufficient in itself. When a greater part of one or both cheeks is invaded, X-rays should be used, since much time may be lost in attempting to treat extensive patches by the Finsen method.

The X-ray is of particular value when recurrence appears following an apparent cure by the light treatment; since shorter applications are required large areas can be treated and the patient is spared the soreness produced by the Finsen treatment. In ulcerating lupus the X-rays are serviceable while the light is usually ineffective. In all cases where the disease proves refractory carbolic acid or tincture of iodine may be employed to supplement the treatment.

Seventy-five cases have been treated. In twenty-one small cases a cure was effected; of thirty-one moderately extensive cases there has been some recurrence, but temporary recovery resulted in the greater number. In eighteen extensive cases general improvement occurred in nearly all and in ten a cure might be regarded as obtained. In the remaining cases progress has been very slow and the patients are still under treatment. Some cases have not been cured after five years' treatment, but if the treatment does sometimes fail to cure it always mitigates the disease and has almost rendered the older methods obsolete. The time factor in the treatment is and must be always the greatest objection.

## THE RADIUM TREATMENT OF SCLEROMA

Otto Kahler — *Wien. Klin. Woch.*, No. 32,  
1905

The preparation used was prepared in the following manner: Fine sheet aluminum was made into the shape of half a hollow cube the side of which measured 15 cm. This was filled with a mixture of finely pulverized radium bromide, xylol, and two drops of dummar lac. After the evaporation of the xylol a thin layer of radium bromide remains on the bottom held down by the dummar lac. The cube was then mounted on a block of hard rubber.

The patient was a woman of 48 years who suffered from scleroma for about 25 years and was frequently treated in hospitals. In 1901 she had several large scleromatous nodules at the nasal meatus and several scleromatous infiltrations of the mucous membrane of nose, mouth and pharynx. The larynx was free. The nodules at the introitus nasi and a large nodule of the soft palate were then extirpated and patient discharged, supplied with hard rubber tubes for the dilatation of the nasal stenosis. She felt quite well for a time. But soon at the upper lip, which was only lightly indurated before, there appeared scleromatous nodules with superficial ulceration.

She returned to the hospital on February 2, 1905. *Status praesens.* Muscles and panniculus adiposus well developed. Internal organs normal. Both alae nasi missing, the septum intact. The upper lip infiltrated and ulcerated. The granulating area extends to the meatus nasi and into the left nostril. On both angles of the mouth an isolated, superficially ulcerating nodule. Palpation shows several deep-seated nodules of cherry size. On hard and soft palate and on the mucous membrane of the cheek scleromatous nodules are seen, the smallest of the size of a pea, the largest of a cherry. Ankylostoma which is present prevents the laryngoscopic and

postrhinoscopic examination. The rhinoscopia anterior shows a defect of the cartilaginous septum, atrophy of the lower turbinates, scleromatous infiltration of the nose. The histologic examination of an extirpated piece of the upper lip corroborates the diagnosis of scleroma.

The radium cube was applied to the diseased parts and fastened with adhesive plaster. To avoid stronger reactions duration of the single radiation was limited to 20 minutes. After about ten days the radiated parts were covered with a gray white scab which disappeared after a few days. The left angle of the mouth was first radiated. After having been exposed for 2½ hours the nodule had almost disappeared. The spot where it had been was covered with skin, only deeper down an induration could be felt. The rest of the area was then radiated, one part after the other, and after about one hour's exposure they began to be covered with skin starting from the margin.

As thus the author's purpose to show that radium rays have influence on scleroma tissue was fulfilled he stopped the treatment because it seemed to take too long a time on account of the extent of the infiltrations, and patient was treated and cured with Roentgen rays.

## EPITHELIOMA CURED BY SUN-LIGHT

M. Hirschberg — *Berl. Klin. Woch.*, No. 41,  
1905

The author reports his own case. On the helix of his right ear he had an epithelioma 1½ cm. long and ½ cm. wide. He expected to have it removed with the knife but postponed the little operation until the return from a trip to Caux near

Lake Geneva in Switzerland.

He took long daily walks on a snow-covered mountain road (it was in December) which was directly radiated by the sun. After about 10 days he suddenly noticed that the lower part of the epithelioma exfoliated. After removal of the piece with the scissors the underlying skin felt perfectly smooth and dry and looked normal. He attributed this result to the sun-rays and determined to systemically continue the unintentionally-begun sun-cure.

About two weeks later the rest of the epithelioma was detached in the same manner as the first part. There remained only a spot of the size of a pin's head which felt somewhat harder than

the surrounding parts and which he, afterwards at home, destroyed by a cauterization with caustic potassium.

No recurrence after 8 months. Hirschberg is of the opinion that it is not always possible to make use of the full light-power of the sun for curative purposes, as a larger or smaller number of rays is lost on their way through the atmosphere. The quantity of this loss depends upon the condition of the atmosphere. The more numerous and the denser the strata of air that have to be penetrated, the more steam and the more impurities the air contains, the more light rays are absorbed. All these factors are best eliminated in the high mountains in winter.

## DIETOTHERAPY

### SOME OBSERVATIONS ON THE EFFECT OF CERTAIN DIET CURES IN DIABETES MELLITUS

Julius Friedenwald and John Ruhräh, *The American Journal of the Medical Sciences*, October, 1905

In no other disease is the diet of greater importance than in diabetes. There is no other rational treatment for diabetes than the dietetic. Diet alone fulfills the indications for treatment, the maintenance of nutrition, the increase in the ability of the body to assimilate sugar, and the avoidance of complications (von Noorden).

This paper does not cover the entire field of the dietetic treatment of diabetes, but is limited to three diet cures, which

have assumed some importance in recent years.

#### I. MILK CURE

Some writers believe that a strict milk diet will either diminish or even cause the glycosuria to disappear entirely in from twenty-four to forty-eight hours in most cases. A certain number of patients are entirely relieved by means of the milk cure, and remain so after again being placed on a diet containing a considerable amount of carbohydrate material. In severe forms of diabetes half a litre (nearly one pint) of milk a day is often well borne without increasing the glycosuria.

Diabetic patients, however, react differently to milk-sugar, and a trial must, therefore, be made in each individual

case. Often the unfavorable effect of milk can be detected only after a lengthy and continuous use of it. Every case must be tested individually to determine the tolerance for this particular article of food. A strict milk diet cannot be used in all cases, even when glycosuria does not appear after taking as much as four litres of milk daily, because it frequently produces an intense anorexia, which is often overcome with great difficulty. The deleterious effect of the milk-sugar may be avoided by the use of the so-called diabetic milk, from which a large portion of the milk-sugar has been removed. It may be reduced to one per cent.

The effects of a milk diet are illustrated by three cases.

*Case 1.* Male, fifty-eight years old, had lost ten pounds in one year, having fallen to 138 pounds. On an unlimited diet, he passed 2980 c. c. of urine, of specific gravity of 1037, which contained 3.9 per cent. of sugar. On a diet free of carbohydrates (von Noorden's standard diet), the urine fell to 2010 c. c., of a specific gravity of 1026, which contained no sugar. This condition remained practically unchanged when the food was increased by adding 150 gm. of bread, and later by adding also 1 litre of milk.

*Case 2.* Female, forty-four years old, had lost six pounds in six months, having fallen to 116 pounds. On an unlimited diet, she passed 2450 c. c. of urine of specific gravity of 1032, which contained 2.8 per cent. of sugar. On the standard diet, she passed 2000 c. c., of specific gravity of 1026, which contained no sugar. The addition of 150 gm. of bread produced practically no change. The further addition of half a litre of milk was followed by the passage of 2280 c. c. of a specific gravity of 1030, and containing 1.8 per cent. of sugar. After the milk was increased to one litre the urine passed amounted to 2350 c. c., of a specific gravity of 1030,

and containing 2.5 per cent. of sugar.

*Case 3.* Male, forty-two years old, had lost forty-four pounds in three years, having fallen to 144 pounds. On an unlimited diet, he passed 3100 c. c. of urine, of a specific gravity of 1040, which contained 4.8 per cent. of sugar, and also diacetic acid. On the standard diet he passed 2600 c. c., of specific gravity 1036, which contained 3.2 per cent. of sugar, and also diacetic acid. When placed on an exclusive milk diet (three litres) for ten days, the urine diminished to 2000 c. c., of a specific gravity of 1030, containing 2.1 per cent. sugar, and no diacetic acid, and the patient began to increase slightly in flesh.

## II. POTATO CURE

A portion of the carbohydrates allowed was replaced by potato, in the proportion of three times as much potato, weighed raw, as the bread for which it was substituted. Potatoes are relatively poor in carbohydrates, containing from 16 to 22 per cent. of starch, while wheat bread contains about 60 per cent.

Mossi attributes the beneficial effects of this diet to the large proportion of water and potassium salts contained in the potato. This substitution of potato for a part of the bread increases the variety of carbohydrate food, and at the same time large quantities of fat can be consumed in the form of butter, which may be added to the potatoes. The heat-producing food which is largely eliminated from the diet, may best be substituted by fats, such as butter. The potatoes may be prepared in a variety of ways, baked, boiled, fried, mashed, etc. In some cases very beneficial results may be obtained.

*Case 4.* Male, 49 years old, lost eighteen pounds in nine months, having fallen to 162 pounds. On an unlimited diet he passed 2800 c. c. of urine, of a specific gravity of 1034, which contained 4.1 per cent. of sugar; on the standard diet, 2050 c. c., of a specific

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gravity of 1026, and containing no sugar; after adding 150 gm. of bread, 2120 c. c., of a specific gravity of 1026, and containing no sugar. After reducing the bread to 50 gm. and adding 30 gm. of potato he passed 2020 c. c., of a specific gravity of 1028, and containing no sugar.

*Case 5.* Female, sixty-two years old, had lost twenty-eight pounds in two years, having fallen to 134 pounds. On an unrestricted diet she passed 3000 c. c. of urine, of a specific gravity of 1038, and containing 2.4 per cent. of sugar; on the standard diet, 2060 c. c., of a specific gravity of 1024, and containing no sugar; after adding 60 gm. of bread, 2800 c. c., of a specific gravity of 1032, and containing 2.4 per cent. of sugar; after reducing the bread to 20 gm. and adding 120 gm. of potato, 2600 c. c., of a specific gravity of 1030, and containing 2.1 per cent. of sugar.

*Case 6.* Female, thirty-seven years old, had lost 33 pounds in three years, having fallen to 139 pounds. On an unrestricted diet the daily quantity of urine was 3200 c. c., of a specific gravity of 1040, and containing 5.1 per cent. of sugar, on the standard diet 2500 c. c., of a specific gravity of 1034, and containing 3.6 per cent. of sugar; after adding 60 gm. of bread, 3000 c. c., of a specific gravity of 1036, and containing 4.5 per cent. of sugar, after reducing the bread to 20 gm. and adding 120 gm. of potato, 2800 c. c., of a specific gravity of 1035, and containing 4 per cent. of sugar.

### III. OATMEAL CURE

A good oatmeal is well cooked for a considerable length of time in water with the addition of a bit of salt; while cooking, butter and a vegetable albumin are added, or the white of egg, beaten and strained, may be mixed with it as the oatmeal cools. Rice albumin is especially palatable mixed with the oatmeal. The quantities to be taken daily are:

oatmeal, 250 grams; albumen, 100 grams; butter, 300 grams. The meals are taken at two hours intervals.

After between eight and fourteen days a vegetable diet day is interposed and occasionally at rare intervals, if the oatmeal diet is to be kept up for any length of time, a small quantity of meat or fish is allowed to relieve the monotony of the diet, and render it bearable. The return to the ordinary diet must be made cautiously, lest the acetone bodies increase to an alarming degree. In mild forms of diabetes this treatment should never be utilized. It has its place only in the severe forms of the disease.

*Case 7.* Male, sixty-two years old, lost eleven pounds in six years, having fallen to 175 pounds. On an unrestricted diet, the daily quantity of urine was 2200 c. c., of a specific gravity of 1028, containing 2.2 per cent. of sugar; on the standard diet, 1800 c. c., of a specific gravity of 1026, containing no sugar; after adding 150 grams of bread, 2000 c. c., of a specific gravity of 1026, containing no sugar, and on an oatmeal diet, 2800 c. c., of a specific gravity of 1038, containing 4 per cent. of sugar.

*Case 8.* Female, forty-four years old, had lost 48 pounds in eight years, having fallen to 124 pounds. On an unrestricted diet the daily quantity of urine was 3200 c. c., of a specific gravity of 1040, containing 5.8 per cent. of sugar; on the standard diet 2800 c. c., of a specific gravity of 1032, containing 3.1 per cent. of sugar; and on an oatmeal diet, 2000 c. c., of a specific gravity of 1024, containing no sugar.

*Case 9.* Female, fifty-nine years old, had lost 44 pounds in four years. On an unrestricted diet the daily quantity of urine was 3800 c. c., of a specific gravity of 1042, containing 6.8 per cent. of sugar, and giving a marked reaction for diacetic acid; on ordinary diabetic diet, 3400 c. c., of a specific gravity of 1040, containing 5.4 per cent. of sugar, and giving a marked reaction for diacetic

acid. After being on an oatmeal diet for eight days, 2400 c. c., of a specific gravity of 1028, containing no sugar nor diacetic acid.

*Case 10.* Female, thirty-eight years old, had lost twenty pounds in two years, having fallen to 110 pounds. On an unrestricted diet, the daily quantity of urine was 4000 c. c., of a specific gravity of 1040, containing 6.2 per cent. of sugar, and giving a marked reaction for diacetic acid; on ordinary diabetic diet, 3200 c. c., of a specific gravity of 1038, containing 5.5 per cent. of sugar, and

giving a marked reaction for diacetic acid; on an oatmeal diet 3400 c. c., of a specific gravity of 1036, containing 5 per cent. of sugar, but giving no reaction for diacetic acid.

These cases seem to justify the conclusion that the milk cure, potato cure, and oatmeal cure are valuable aids in the treatment of diabetes. Great care, however, must be practiced with the use of these various forms of diet. Each case must be studied individually, and must be carefully watched in order to obtain the very best results.

## CLIMATOTHERAPY

### THE INFLUENCE OF CLIMATE IN PULMONARY TUBERCULOSIS

*The Medical News*, November 11, 1905

This timely contribution constitutes the report of a committee appointed by the National Association for the Study and Prevention of Tuberculosis. The personnel of the committee, consisting of Drs. Chas. L. Minor, E. R. Baldwin, S. E. Solly, C. F. McGraham, Henry Sewell, and Norman Bridge, is a guarantee that the report is the result of careful and conscientious thought and study.

Opinions concerning the effects of climatic changes in pulmonary consumption are developed from two standpoints—(1), the observer in the health resort—(2), the practitioner in other parts of the country or world.

The observer at the climatic station has the advantage of seeing many cases each season. The beneficial or curative effects of the climate are so frequently impressed upon him that he has difficulty in understanding how they can be called in doubt.

The practitioner in other parts has a comparatively limited experience with climatic cases. Perhaps he has referred hopeless cases to a health resort with, of

course, but little or no benefit. Possibly also a case partly arrested at the resort relapses soon after returning home. The physician at the resort while having ample clinical opportunity, is apt to be suspected of partiality and of being affected by his personal interests. The home practitioner lacks clinical opportunity and is thus handicapped in drawing his conclusions.

It must be remembered, however, that after all it is only by honestly-made and scientifically-recorded and interpreted observations of the practitioner in the health resort, combined with the detail watching and after-study of the case by the doctor at home that this question shall finally be settled, and it is most desirable that these men should get together and study the case impartially.

Recent skepticism regarding the value of climate is the result of several causes: (1), the unskillful employment in the past of climate as a therapeutic measure; (2), in the formerly widespread belief in a mysterious specific influence of climate which led to a superstitious (and unfounded) faith in its unaided powers, hence to a neglect of the important matters relating to hygiene, diet, proper instruction of the patient, and detailed su-

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pervision; (3), in the effect on the general profession of their recent and all too limited experience with out-door treatment at home, which has caused them to go from the extreme of an undue hopelessness in the past to that of an equally unwise hopefulness that any case can be cured in any atmosphere by sleeping out on a porch and eating heartily and freely.

It is the opinion of the distinguished investigators that a patient should not be referred hap-hazard to a health resort but should receive full and detailed instructions as to what he should do when he gets there, and during his stay there he should be under the observing eye of the resort practitioner. The open-air home treatment is by no means to be decried, but on the other hand we should not allow ourselves to be carried away by our enthusiasm. It should not be forgotten that the addition of climate to the effects of the open-air cure is too valuable to be neglected when it is attainable.

While not admitting a specific influence of climate in the treatment of tuberculosis its therapeutic influence is not to be doubted and is as certain as are the effects of any of our standard doings or other measures. Its stimulating effect on all the vital processes, the deepening of respiration with the consequent improvement of gas interchange, the awakening of appetite such as can be gotten by so doing, the improvement of the mental attitude, all these are plainly in evidence. No advanced workers in this line would today, as was formerly done, place climate first in the order of therapeutic measures. Let it never be forgotten that hygiene, diet, teaching, and supervision of the patients must always come first, but granted that these are properly attended to, then enters the powerful element of climate, reinforcing and accentuating the effects of these other measures and yielding results that cannot be approached even, with the same care and watching and food in less favorable localities.

The elements in climate which have a beneficial influence may be arranged as follows—(1), abundance of and bacteriological and chemical purity of the air; (2), sunshine; (3), coolness, or in a certain number of cases, warmth; (4), dryness, or in a few cases, a moderate degree of humidity; (5), altitude; (6), wind; (7), equability; (8), soil.

The bacterial and chemical condition of the air has been carefully studied, and has been found to vary from a very high pollution in the streets of our large cities, to an almost absolute purity in high mountains, open seas, deserts, and the Arctic regions. A very slight degree of atmospheric pollution is found in country and mountain climates, especially when sparsely settled.

After pure air the committee would place sunshine and sun-heat, whose effects are both direct and indirect. Although its direct effects are evidently beneficial, they have never been completely analyzed and therefore are not dwelt on in this place. The indirect effects of sunshine as seen in its powerful stimulation of the patients' spirits are of great importance.

Dryness in most cases is a most important factor through its valuable anti-catarrhal effects, but when extreme this influence may be reversed, and there are not a few cases in which a moderate degree of humidity is more beneficial. As a rule low relative humidity with moderately low temperatures has a tonic effect and is beneficial, but such low humidity with very low temperatures is apt to irritate the respiratory mucous membranes and may thus prove harmful. Low relative humidity with high temperature is generally debilitating. High relative humidity and moderate temperature is soothing to the irritated mucous membranes, but high humidity combined with low temperature favors catarrh. As a rule the average tuberculous patient makes his best gains in cold, dry weather with a low, or moderately low tempera-

ture, although a few cases do better with high relative humidity and warm temperature.

Equability is of value in the cases of very old or feeble persons but its importance has no doubt been over-rated. Variations in temperature stimulate the vital activities, in strong patients, hence, the opposite of equability may also be useful.

Wind may be injurious if the patient be directly subjected to it, but its purifying influence on the air is beneficial provided he be properly protected.

Some degree of altitude, having due regard to the patient's vitality and heart power, is conceded to be most desirable, owing to the greater purity of the air and to its stimulating effect on metabolism, the appetite, etc.

These climatic factors are all to be considered but they are not enough. The individual temperament of each patient should be studied, for these play an important part in getting the best result from a climatic cure. His ability to withstand the pangs of homesickness, and his willingness to obey instructions are important points. Financial considerations are also a weighty factor. If the patient is unable to provide himself with proper quarters, food and care at a climatic resort, it is far better for him to remain at home and thus carry out as far as possible the open-air treatment. But for those who are comfortably off, or for the well-to-do, it appears to the committee that any results they could obtain at home, even under the most desirable conditions, can be infinitely improved, and the percentage of cures or of arrested cases greatly increased by the carrying out of similar treatment under the favorable influences of a judiciously-selected climate.

#### TENT LIFE IN THE TREATMENT OF TUBERCULOSIS

J. Edward Stubbert, *The Medical Brief*, December, 1905

Stubbert has had a number of patients

with this disease living in tents in Sullivan County, New York, both winter and summer and believes that his experience and that of other observers who have tried tent-life for these patients in the New England and Middle Atlantic states, demonstrates that it can be used with advantage even in the climate of these regions; beneficial results are very much more marked than those observed when the patient is treated in the house, hotel, or sanitarium. Many of the good effects may be attained by having the patient sleep on open verandas in the country or on fire-escapes and roofs in the city, but sleeping in a room with open windows does *not* give the same beneficial results.

The construction of the tent is somewhat important. He recommends constructing a platform six or eight feet above the ground and fitting the tent on this platform. The roof of the tent should be fixed, but all four sides should be susceptible of being rolled up or drawn out as flies during the day time, and these sides *should not be closed at all* except when the patient requires privacy for dressing, etc. It is better to have the tent pitched on the side of a hill, because in this way perfect drainage will be attained and too violent winds will be avoided, and the tent should be pitched in the open rather than in the forest, as sunshine will keep the tent in a sanitary condition and is one of the most valuable therapeutic agents with which to treat tuberculosis. Symptomatic treatment and general medical supervision are just as important when the patient is undergoing the tent regime and should be carried out just as thoroughly as under any other conditions.

If expense is not a matter of consideration a chimney may be erected on the weather side of the tent with an open fire-place for use in very chilly or rainy weather, and as a means of drying the patients' wearing apparel. Some tents in use in Sullivan County not only have

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the chimney and fireplace but are fitted with electric lights, bath and toilet, all of which were built on the windward side of the tent, thus rendering it possible to keep the other three sides open.

AN ADJUNCT TO THE FRESH-AIR TREATMENT OF CONSUMPTION

George T. Carpenter, *Medicine*, November, 1905

Carpenter describes an apparatus by means of which a patient may remain in a room so heated as to be comfortable, and read or sew, and at the same time inhale an abundance of fresh air and not contaminate the air of the room. It "consists of tubes large enough for the passage of air at normal air-pressure, and light enough to be easily handled. The face-piece or mask can have a transparent front, and is supported by a net cap, which will hold it firm in all positions, and large valves control the passage of air. The tubes are composed of coiled aluminum wire, covered with a light fabric which is impervious to air. These tubes are conducted to a panel which is fitted in an open window, with a suitable aperture to receive it, and a protecting hood on the outside. Openings can also be made through the outside wall of a bedroom to the outer air, choosing a side where the sun shines. The tubes may be detached from the opening, and the opening closed, and the apparatus can be carried to another part of the house and attached to an opening through the wall or paneled window. The mask is so arranged that it can be detached from the net cap, which is convenient in case of a desire to cough or expectorate. The inhalation tube can be large and contain the exhalation tube, so that but one tube is in sight, and yet all exhalations are carried to the outside of the house."

"With this contrivance it is possible for patients to have fresh air, no matter

what is the state of the weather. They can also enjoy a sun bath in a superheated room, if desired, and inhale fresh air at the same time."

He considers that fresh air, hygienic surroundings, and a bountiful supply of good food constitute the best known treatment of consumption and believes that this apparatus will prove to be of value to those who cannot afford to go to far-away places, or who prefer to stay at their homes.

*ON MEDICAL LIBRARY*  
SEA AIR TREATMENT OF  
TUBERCULOSIS OF THE BONES  
AND GLANDS IN CHILDREN

MAR 27 1907  
John Winters Brannan, *The Medical News*,  
November 11, 1905

The chief points in this paper have already appeared in the columns of *THE ARCHIVES* for September, 1905, page 175, in an abstract of the house surgeon's preliminary report. Brannan's paper verifies the exceedingly favorable observations of the resident medical officer in all particulars.

The first year's experience at the Coney Island Tent Hospital for surgical tuberculosis, the pioneer institution of this kind in America, has been very encouraging. The hospital consists of a number of tent cottages, four to be used for wards, the others for nurses, dressing-room, dining-room, kitchen and isolating-room. Eight of the tents are arranged as an octagon, with a board walk connecting them and enclosing a playground of sand, thirty feet wide. The tents have wooden floors raised eighteen inches from the ground, and sides of wood for the lower three feet.

Some 54 children in all were taken care of during the summer. Some of these came direct from the tenements where they had been attended by private or dispensary physicians, others came

from the city hospitals. They were suffering from hip disease in various stages, Pott's disease, affections of the long bones, tuberculosis with open sinuses of the ankle; in fact, all the varied forms of bone tuberculosis, as well as tuberculosis of the glands. No attempt was made to select the cases; they were of the usual grade of severity that is found in the orthopedic wards of the children's hospitals of New York. (The details of the daily regime will be found in the article above mentioned.)

Improvement began in the children at once. When they came most of them were pale, languid, rather fretful, with uncertain appetite and with a disinclination to play or even talk. Within a week their spirits improved, they slept soundly, awoke with an appetite, were ready to join in play, and it was soon difficult to believe but for the visible evidence of disease, that they were other

than the ordinary children one sees at the seashore resorts. Their faces became rosy, the circulation improved, and the gain in weight was almost constant. Several patients who were unable to walk when they came, at the end of two or three months were able to run about and play with others.

The improvement in the local lesions naturally required a longer time to manifest itself, but now at the end of a year marked progress in nearly all the cases may be reported, amounting in some cases to an apparent cure. A few operations have been necessary, but they have not been of such magnitude as to depress the patient. In fact the rapid progress after operation has been one of the most striking results of the open-air treatment. A number of individual cases are cited by Brannan which forcibly illustrate the marked value of the seaside treatment of surgical tuberculosis.

## MECHANOTHERAPY

### THE TREATMENT OF JOINT STIFFNESS BY MEANS OF GRADUAL RECTIFICATION COMBINED WITH MASSAGE

Gustav Norstrom, *Medical Record*, November 4, 1905

Stiffness of joints may be caused in three ways: By (1) traumatism, (2) rheumatism or gout, (3) chronic inflammation depending on tuberculosis.

In the first class the worst cases are those in which the ankylosis has occurred after periarticular fractures. Here the formation of callus that can not be reduced produces a permanent immobility of the joint. If ankylosis results from immobilization of a joint, as in treat-

ment of fractures, it can usually be overcome by massage and manual flexions and extensions.

Ankylosis of rheumatic origin presents several varieties but in general they are amenable to treatment. In cases that are clearly attributable to gout any mechanical treatment is likely to stir up the disease and lead to worse conditions than existed at the beginning of treatment. The same may be said of tubercular adhesions where the activity has not entirely subsided. Where the bacilli no longer exist in the tissues about the joint and ankylosis is not complete the result of this form of treatment is often very satisfactory.

The technique involved in this treat-

ment consists of massage applied to soften the tissues and produce relaxation about the joint and then the manual reduction of the deformity by flexions and extensions. This is followed by effleurage to prevent swelling of the parts, which last will often constitute a serious complication if the circulation is not thus assisted in the injured parts and the nutrition kept at a high standard. Where the reduction of the capsular stiffness is sudden there will of necessity be slight hemorrhages and effusions with a tendency to inflammatory action as in the case of a sprain. This, however, does not indicate immobilization for the joint

but on the contrary such activity of it as shall secure the best circulation and absorption.

The question of sudden or slow stretching of the contracted fibres must be determined by the nature of the case. Where the bands are extensive and short the sudden breaking up of the adhesions under an anesthetic is to be preferred, but where the defect is due to muscular contracture and retraction of ligamentous structures the slow or gradual extension is preferable. In these cases of false ankylosis contra-indications are found in senility, great weakness and extreme nervous impressibility.

## AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION

*(Concluded from last number)*

### SCIATICA

Dr. FRANCIS B. BISHOP (Washington, D. C.) laid stress upon the fact that the reason why medical and electrical treatment often failed in cases of sciatica was mistaken diagnosis, especially the differential diagnosis between neuritis and neuralgia, and the difficulty of locating the cause of the pain which was frequently produced by reflexes. The author explained in considerable detail the treatment applied by him according to the various conditions, causes, and state of the trouble, giving great prominence to the various electric modalities. The greater number of his successes in the treatment of neuralgia were achieved by the continuous current, large positive electrode over lumbo-sacral plexus with smaller negative over the painful part of the nerve, although other methods had in certain cases been found equally gratifying. True sciatica was in most cases benefited by electricity in connection with quinine medication.

Dr. WALTER HENRY WHITE (Bos-

ton). I am glad to have heard Dr. Bishop's remarks, and can safely coincide with him in his manner of treatment. It is certainly often a difficult point to decide whether we are confronted by a neuritis or a neuralgia, and often a mistake will occur in the diagnosis, so that the consequent treatment may tend to aggravate the case.

Dr. BRINKMANN. I was glad to hear Dr. Bishop attach so much importance to the question of diagnosis, because a cure of sciatica depends upon a clear and accurate conception of what we have to meet. I believe before a physician can form a conception of the condition of the nerve, he must form a conception of the patient. He must make a blood and urine analysis, a general physical examination, and finally he comes to the examination of the nerve. He then endeavors to find out what has led up to that condition. If he takes the physical conditions in the pelvis into consideration as near as possible to the nerve, he will come near right every time as to its nature and location.

As to the question of neuralgia and neuritis, many cases of neuralgia yield to the proper use of the enema, and require no further treatment. After you have excluded tumor and organic pressure conditions, and you find nothing in the pelvis and spine, then you may start on an outside pelvic investigation.

As to the character of modalities used for the various conditions, I agree with Dr. Bishop that if you have an organic condition of the neuralgic nerves, and you want the whole effect of the electric current, you must use the continuous current. It is a perfectly well-known fact that at intensely high rates of oscillation there is a limit of sensation producing analgesia. Whether you employ a high pitch faradic or mechanical vibration, you will get the same result. But in mechanical vibration you vibrate the nerve at all points, and thus may offer some advantages.

Dr. DIXON. The limited time at our disposal makes it impossible to discuss this paper in the exhaustive manner in which it shoud be discussed, and one must just select one or two points from the whole field of sciatica. I find that a great deal of good can often be accomplished in the early stages of the trouble by the use of an electrode that has been attached to the positive pole after you have induced the wave current, and applied it over the course of the nerve. Neither counter-irritation nor anything else can compare with the continuous current.

As regards the use of the static spark in more chronic cases, the effect is only a very local one, but produces good results. Mechanical vibration also is of great value in these cases, but the chief point is to diagnose the case correctly.

Dr. STRONG. What interested me particularly about this paper was the mention of the vibratory current obtained by the spark discharged from the static machine. Many of you know that I have spent years in the study of oscillatory and other currents, and was struck

by Dr. Brinkman's remarks that the treatment of any condition depends not upon the nature of the current, but upon the frequency of vibration.

I believe that it is possible for us to simplify our technique to a great extent by a combined or individual study of the relations of frequency in vibratory currents to their therapeutic effect. I believe that a certain range of frequency enables us to control the conditions of the motor nerves. If we use the high frequency current, as Dr. Brinkman says, to obtain analgesic and anesthetic effects, we have obtained our vibration roughly with the normal form of oscillation of the central nervous system.

I believe that the keynote of therapeutic measures in the future will be the study of what actually goes on inside the nerves, and that physiologists have made a mistake in not endeavoring to measure the electric current from its effects upon the nerves. We all know that the nervous currents — whatever they may be — resemble electricity in many ways, but if we endeavor to measure their voltage and amperage, we obtain no results. We are not dealing with a continuous current in one direction, but with an electrical oscillation, and I hope that in the future physiologists will direct their investigations upon nerve energy from this standpoint. I believe that the results will be very useful. I also believe that Dr. Bishop, in applying this current to the treatment of nervous diseases, is on the right track, and that by a closer study of frequency in relation to therapeutic measures we can simplify our technique to a great extent, and that it will enable us to bring order out of chaos in a large number of difficult conditions.

Dr. NUNN. During the discussion of this paper it has occurred to me to draw upon my memory about a case which once troubled me a great deal. A lady had what appeared to be a neuralgia in the right thumb which hurt her intensely. All my examinations were attended with

negative results. By accident I found when she took off her shoe on the side on which that thumb was, the pain disappeared. It was nothing but a reflex action from pressure upon the great toe. I mention this simply to draw attention to the fact that the reflexes are those phenomena which trouble us most in our diagnosis, and it is extremely difficult at times to exactly locate the point of irritation from which the reflex action proceeds.

This meeting has been to me one of considerable interest because of the advances that are being made by this Association in the study and the adoption of the mechanism of nature. I may be forgiven when I say in the presence of the gentleman who read the paper, that one of the most valuable contributions to our literature upon this subject, has been the paper read by Dr. Herdman in the beginning of this convention. The last speaker struck the keynote: it is a question of vibration entirely. It is a question of understanding the primary principle of vibration that is at the bottom of all life. Let me illustrate, by an instance, what I wish to say. A singer strikes a keynote, or a certain note is struck on the piano: it vibrates all over the room to whatever part of the room you go. You all remember the story of Brunnells Bridge. A poor fiddler came along one day and asked for a donation which the men on the bridge refused. Then he began tuning his fiddle and struck the keynote so persistently that the bridge began to sway and the men had to pay him to desist. In military marches the soldiers have to break the step when walking over a bridge to prevent setting up vibrations, and at Niagara no dogs are allowed to cross the Suspension Bridge because they will start the vibration.

Referring again to Dr. Herdman, and the vibration of ions, whenever you can attune yourself to their requirements, you are right, because there is the key-

note in our effort to cure through vibratory measures.

Dr. SNOW believed that local lesions are at the bottom of nearly all cases, that administration of means is indicated which will restore circulation and get rid of pelvic congestion, and that in chronic cases the X-ray is invaluable.

Dr. JOHNSTON. Determining the cause of a sciatica, is a very important, but at the same time a very difficult problem. I have had one case which may be somewhat unique. The patient, male, had a chronic neuritis for three years, and was suffering from a most obstinate sciatica. He came to New York and went to various electrical specialists with no relief. Finally I operated on him with the idea of curing this sciatica, and I found — as you will always find in long-standing cases — pelvic exudates. These were carefully dissected out and the man made a good recovery: he has never had sciatica since. This shows, therefore, that the advice which has been given, always to examine the pelvic cavity, is very important.

Dr. TOUSEY. When Dr. Bishop made his remarks about the difficulty of differentiating between neuritis and neuralgia, he should have called attention to the points of difference he makes.

Dr. BISHOP (closing discussion). I think the paper answers Dr. Tousey's question as distinctly as possible. In the acute neuritic condition I always use a very mild continuous current, never under any circumstances a current which will produce the slightest pain to the patient, or increase it. I apply the electrodes in such a way that they could not be removed, and turn the current on slowly by means of a rheostat. When I have carried the current up to the point which I think is necessary, I leave it there until the patient begins to feel some soothing effect. We must not expect in a case of acute neuritis to relieve pain absolutely on the first application; we can only change the condition in that

nerve. Pain can in my opinion not be absolutely removed by the first application without doing harm when the reaction comes on. Reaction always comes on after strong electrical treatment, and in the treatment of acute neuritis I am always very careful to treat in such a way as not to produce a reaction.

When the case becomes subacute, when there is less pain, and especially the motor fibres are affected producing some partial paralysis, then I apply the continuous current, and after that a wave current or an oscillatory current. This current I mentioned at this Academy in 1900, when Dr. Morton exhibited what was known as the Morton wave current. After Dr. Morton had exhibited the current, I got up and questioned him as to whether there was any other current he had ever used for the treatment of neuritis. He said no. I then called attention to the fact that by the removal of the chain from the machine we can get a minor current which can be used to greater advantage. I have done it steadily ever since. A wetted pad or a tin foil wetted was placed over that point and sustained there. Then vibration is turned on very gradually, and only barely susceptible to the patient, exciting some vibration in that nerve and muscle and relieving the pain.

When the condition is still more chronic and accompanied very often by a paralysis, I use the continuous current, bringing about possibly a normal condition of the muscle. Then I use vibration more strongly.

In the more chronic stage, where there is very little pain, I apply the Morton current. Dr. Morton is entitled to the current because he was the first to bring it prominently before the public; although in 1895 I wrote a paper upon it as derived from my static machine, but Dr. Morton brought it promptly before the public as the Morton current.

As to the treatment of neuralgia, always try to ascertain and remove the

cause. There is no treatment for painful nerves except temporary relief, unless we find the cause and remove that. I did not wish to take up the time of the Association too long, and therefore did not discuss this subject at length. The cause may be found anywhere in the interior pelvis along the whole course of the spinal cord and even further back. But in order to systematize the disease, we have to examine the patient. The only thing that excited the writing of this paper, was that we so often see the disease treated by certain currents which absolutely do no good, and while we have no doubt in the world as to the efficacy of electricity in some form or other, we must in the first place never forget to go back to first principles, and find out the cause of the disease we are called upon to treat.

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#### EXPERIENCE WITH RADIUM IN DISEASES OF THE THROAT AND NOSE

Dr. W. FREUDENTHAL (New York City) stated that, although the effects of rays of radium and its emanations are still a matter of speculation, yet they are so remarkable as to be of interest to every one. He mentions a case of tuberculous laryngitis published in part in the Archives of Electrology and Radiology a year ago. Remarkable were the granulations springing up from different parts of the larynx after the exposure to radium, thus diminishing its lumen materially. For that reason the author was compelled twice on account of slight dyspnœa to interrupt the treatment. A day sufficed to restore these parts and widen the glottis. The granulations that sprung up so quickly after a few exposures are analogous in one respect to the changes produced by the injection of the old tuberculine of Koch.

Since the publication of this case, the author has used radium bromide of one

million radio-activity contained in a small aluminum tube, as sold by Lieber & Co., of this city. Ten cases of tuberculosis of the larynx were treated in that way, and the results achieved were gratifying in a certain number.

After reporting one case of *rodent ulcer* cured by radium, Freudenthal discusses *malignant tumors*. One case of epithelioma of the tonsil in a man of 60 years of age improved in the beginning of the treatment, but finally died. Another case of cancer of the larynx did not show any improvement at all, and total laryngectomy had to be performed. Now four months after the operation the patient is doing well.

Better results as regards relieving immediate danger from inanition were obtained in the third case. A lady 63 years of age was suffering from a large malignant tumor of the neck, affecting also the œsophagus and the larynx. Swallowing had been difficult for a long time, but of late it had become so bad that even liquids could be taken only with the greatest difficulty. It was evident that under such circumstances the death of the patient was only a question of a few weeks, perhaps only days. Radium was applied immediately with the satisfactory result that after a few exposures patient could swallow much easier, and soon could take even some solid food. The further history of the case is unknown.

In conclusion he said: "The advantage of radium over other rays, especially the Roentgen rays, cannot be definitely formulated as yet. Perhaps it will still take a long time to do so. However, it cannot be denied that the exposure of the body cavities to the radium is an easy matter, and that it is much less dangerous than, for example, the X-rays. We have achieved some real cures in laryngeal tuberculosis, and this fact alone ought to encourage us to experiment further with these wonderful rays."

There was no discussion.

*Third Day, Thursday, September 21, 1905*

## SUCCESES AND FAILURES IN ROENTGEN THERAPY OF EPITHELIOMA OF THE LIP

Dr. G. H. STOVER (Denver, Colo.) does not believe Roentgen therapy to be applicable to all cases of epithelioma of the lip; he gives surgery the absolute preference if the mass be large, or if its appearance is such that glandular extension seems imminent.

When original lesion does not seem to be so threatening, though there are indurated glands in its neighborhood, he believes that a radical operation should be advised, yet the results of Roentgen therapy in some glandular cases lead him to believe that he may possibly modify this position in future. Microscopic examination of glands which he has treated and which have been removed, have in several instances shown that the Roentgen ray has a destructive action on the carcinomatous process in glands.

He thinks that his results are somewhat better since he began the use of fluorescine, but the cases so treated are not yet old enough to report upon positively.

In the instances where there is more or less of a choice between Roentgen therapy and operation, he is inclined to give the patient the benefit of Roentgen therapy for a time, believing that even if operation must be done later, the X-ray treatment will have been of benefit.

When the disease is superficial, not of great extent, and without involvement of glands, surgery is not considered to be so good a treatment as Roentgen therapy; he says that nearly all of this class of cases will recover under the ray, hence it is not right to subject the patient to the risk of an anaesthetic, nor to leave him disfigured by an uncalled for operation.

Prophylactic raying after operation seems to be a rational procedure, but it

is too soon as yet to state a definite opinion as to its value; but if a recurrence appears after an operation he would advise a thorough trial of Roentgen therapy before advising another resort to surgery. It is his impression that recurrences are less frequent after Roentgen therapy than after surgery.

He seems to prefer coils to static machines, as he mentions using 10 coils of various types as against two static machines, and prefers tubes of the automatic vacuum regulator kind. Friedlander shields are used with all treatment tubes, not only to protect himself and his assistant, but also to protect parts remote from the site of the disease; the application of the ray should not be too closely limited to the diseased area, and it would be well always to expose all lymphatic glands in the vicinity very thoroughly.

Applications are made three times a week, as it is believed that this plan gives better control of reaction than when treatments are given oftener, and the usual time of exposure is 10 minutes, varying somewhat according to conditions.

The apparatus for measuring the amount of Roentgen energy he believes not to be very useful as yet on account of the many factors which are apt to vitiate the readings of these instruments. In treating these cases it is not considered desirable to produce a dermatitis, but if such occurs it is taken as indicating that full action is being had, and the frequency or length of exposures is modified.

**Dr. TOUSEY.** Dr. Stover has met with the same experience as others who have treated epithelioma of the lips. The cases which are distinctly favorable will yield to the treatment with the Roentgen ray, but in cases of long standing no favorable results can be expected. The general experience has been that the X-ray has not proved very suitable for the cure of epithelioma of the lip.

**Dr. WILLIS.** I had a case, male, 58

years old, great pipe smoker, who had a scab on his lip, and also gum bleeding some time last winter. He came to the office, had one treatment with the X-ray, and in less than three weeks all trouble had stopped and has not since reappeared. Presumably it was a commencing epithelioma.

**Dr. EATON.** I would ask the doctor if in these cases he has ever used any other treatment than the X-ray.

**Dr. STOVER.** I did not try any other form of electricity. When the lesions extended deeply, my successes have been limited.

## THE STATIC SPARK AND ITS THERAPEUTIC INDICATIONS

**Dr. W. B. SNOW** (New York City) reviewed the historical, physical and therapeutic evolution of the static spark, and gave a detailed description of modern static machines and the various methods of application of static electricity. He concludes that in the treatment of certain inflammations of the large joints no other modality is so effective in eliminating the products of inflammation and restoring a normal condition.

There was no discussion.

## SYNCHRONOUS, MULTIPLE PITCH VARIATION, PRIMARY AND INDUCTION CURRENTS

**Dr. M. W. BRINKMANN** (New York City) reviewed the field of multiple interrupters and harmonic induction currents as described and developed by him in previous papers, then took up the physics of this subject as applied to a new form of interrupter. In the device as developed by the writer of the paper there are a number of parallel steel ribbons, all of them fastened at one end, whereas the other ends are fastened to a sliding device having a small longitudinal move-

ment. This slide is actuated by a system of levers whose motion is imparted to them by a rheostat-controlled electric motor, through the medium of gear wheels. These ribbons, with their soft iron armatures and platinum contacts, serve as the interrupters for an induction coil. As the tension is increased synchronously and decreased in the same manner, the ribbons are continually varying their tension, and hence interrupting at different harmonic pitches at each cycle of their tensile condition. After a discussion of the physics of the vibratory rates as generated above, the interference and re-enforcement of the nodes and anti-nodes, the writer discusses the physiological action of this current. The paper closes with a discussion of the therapy of this current.

The appendix to the paper discussed the functions of several pieces of apparatus devised by the writer (which were also demonstrated) for the determination of the physical properties and constants of the metallic ribbons employed in harmonic coils. These instruments consisted of, first, a balance testing machine, with micrometer screw of 20 threads to the inch; the balance giving reading to single ounces. The undulatory motion to the ribbon under test, being imparted by an electro-magnet and platinum contact-maker; the elongation being imparted by an electro-magnet and

The other device was a micrometer-testing apparatus, for measuring the elongation and breaking strain of the ribbons under test.

There was no discussion.

#### THE PRESENT STATUS OF THE TREATMENT OF MALIGNANT TUMORS

Dr. WILLIAM EDGAR DEEKS (New York City) conceded that opinions differed considerably as to the treatment of malignant tumors, that each operator favored his own methods, but that unfortunately there was not as yet any certain

methods in all cases. Dr. Deeks came to the conclusion that under proper therapeutical measures the lives of these patients could be greatly freed from suffering, and in many cases indefinitely prolonged. While not discarding surgery, he thought that the latter could be made far more effective if supplemented by other measures, notably the X-ray, especially when used with a Crooke's tube as modified by himself (exhibited). For this treatment the author claimed relief of symptoms, retardation in growth, frequently partial absorption, sometimes complete cure and, finally, the most brilliant results in breast and superficial cases. The internal administration of fluorescing bodies contributed to the therapeutic value of the X-ray.

Radium was another therapeutic agent of value, especially in certain situations inaccessible to the X-ray. Radiotherapy was now a therapeutic force to be reckoned with, as it would accomplish what no other therapeutic agent could. Serum therapy had not yet been sufficiently developed.

Mr. HUGO LIEBER (New York City) volunteered a scientific explanation as to the nature of the X-ray from the physicist's point of view. He also suggested that the aluminum tubes containing radium should be dipped into collodium instead of placing them in a second (celuloid) tube, the latter forming an undesirable obstacle to the radiations.

Dr. MASSEY regretted that the author had practically narrowed his treatment of malignant tumors to the X-ray, especially in the earlier stages.

Dr. MORTON agreed with the paper in every way, also in that too much stress had been laid upon surgical methods. His belief in the combined treatment was firmer today than ever before, and in a few years radiotherapy would be recognized as quite as important a factor before as after an operation, also as an ordinary antiseptic preceding any operation.

Dr. DEEKS (closing discussion) agreed with Dr. Lieber's suggestion as to the treatment of radium tubes.

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## ELECTRIC LIGHT IN THE TREATMENT OF SYPHILIS

Dr. H. FINKELPEARL (Pittsburg, Penn.) presented a clinical report of 31 cases of undoubted syphilis treated by him in which electric light (both incandescent and arc) was used as an adjunct to the standard anti-syphilitic remedies, and one case in which electric light alone performed the cure. As the writer also treated a number of other cases of undoubted syphilis with drugs alone he had an opportunity to watch both sets carefully, and estimate the amount of benefit derived from the *energy of light* in this formidable disease.

From the 32 cases treated by light and recorded, five are cited in detail.

*Case I.*—Male, age 32, with extensively distributed gummatous lesions of the skin, resisted the mercurials, the iodides and sulphur baths, but was cured completely by a course of 15 incandescent and six arc-light baths.

*Case II.*—Female, age 27. This patient had troublesome lesions of the entire buccal cavity, also a very annoying salivation. Although she took her medicine faithfully she did not get along satisfactorily until the electric light was added to the treatment. The buccal lesions began to show improvement after the second incandescent bath. The ptyalism disappeared after the third incandescent bath and patient was completely free from all mouth lesions after the ninth exposure.

*Case III.*—Male, age 23. His entire body was covered with a papulo-pustular and squamous eruption. The buccal cavity was covered with ulcerating patches. He was immediately given incandescent baths in addition to mer-

cury by inunction. The eruption disappeared after the third radiant bath, the inguinal glands receded promptly, but the mouth and pharynx remained rebellious for some two months, probably on account of the alcoholic tendency of the patient.

*Case IV.*—Male, age 30. Patient had a lesion on his genital organ, which was diagnosed as a mixed sore. Symmetrical inguinal enlargement with suppuration on the left side. Maculo papular eruption. After incising the bubo radiant baths were given in conjunction with a mild mercurial by the mouth. All wounds healed and eruptions disappeared in less than three weeks, with no relapse after six months.

*Case V.*—Female, age 24. Syphilitic laryngitis appeared four years after the initial lesions. Mercury and iodides were used for three months, but patient showed no improvement. She became discouraged and incandescent baths were added to the treatment. Some improvement was noticed after second bath, and laryngitis cleared up completely after the seventh radiant bath. Patient then abandoned treatment for several months, when a hemiplegia developed. The radiant baths were at once begun in conjunction with the usual drugs, and the hemiplegia is disappearing rapidly. Patient still under treatment.

Dr. Finkelpearl concluded by saying that in his hands electric light has been a very valuable adjunct in the therapeutics of secondary as well as tertiary syphilis. The cutaneous and arthritic manifestations are particularly benefited by light. The general condition of the patient is noticeably better when light is used, than when drugs alone are given.

Dr. CLEAVES. Dr. Finkelpearl will not mind my stating that he is one of my students, and I am more than pleased that he has put his knowledge to such excellent account. I have not had the opportunity of treating the variety of

syphilitic cases that he has had, but I do recall one bad case of tertiary syphilis. The lips were swollen and the bridge of the nose was gone, as if bitten off. She had been having mixed treatment, but did not get any better. I treated her by means of a lamp having small iron electrodes, which gave a great quantity of energy. There was an improvement after the first treatment. There was an improvement in the color and the sore began to heal. Applications were made twice a week, and under compression so as to make the parts bloodless, and that the energy of the light might penetrate more strongly. After three weeks she had no more sores. I also threw the light up through the nares from a marine search-light to facilitate the healing of the disease of the nose. She made a perfect recovery.

I do not see these cases often, but they interest me very much, because here and there you find that the exposure of syphilitic cases to the action of light gives good results. We need something that has a strong oxydizing action. As to drugs, I do not think myself justified in denying mercury, but it is the oxydizing action of the light evidently that exercises the favorable influence.

**Dr. PHELPS.** In this particular case, where there was a lesion, I should want all the chemical energy I could get. In these cases of systemic conditions accompanied by skin eruptions, which Dr. Finkelpearl described, I believe that if we combine constitutional treatment with the application of incandescent light, the result will be better.

*A Question.* Is there any other effect besides?

**Dr. PHELPS.** Yes, there is a very strong chemical effect. With the incandescent light there are no ultra-violet rays, but only small blue-violet rays. I should want an arc light to fix the medication.

## ETIOLOGY AND ELIMINATION OF DIABETES

In the absence of the author, Dr. G. LENOX CURTIS, of New York City, this paper was read by Dr. Patchen; abstract will be found on page 320 of THE ARCHIVES for December, 1905.

## AN INTENSIMETRIC SCALE FOR X-RAY DOSAGE

**Dr. SINCLAIR TOUSEY** (New York City) showed an instrument for measuring the intensity of X-rays which he had devised, and the use of which is based upon the measurement in metres (practically equivalent to yards) of the greatest distance at which visible fluorescence is produced in an ordinary box fluoroscope. Thus the record of an exposure might read:

Intensity 8 (Tousey); Penetration 6 (Benoist); Distance 30 cm.; Exposure 2 minutes.

If these factors are reproduced the same effect is secured no matter what type of apparatus is employed or what strength of primary and secondary currents or spark gaps or resistance are used. All the other details of the manipulation are of value for the operator's own guidance, but would be worthless to any one without a most intimate knowledge of the outfit employed.

To get the same effect the quality of the ray shoud be the same. This may be determined by the degree of penetration, such as 6 (Benoist), but the other factors may be varied. Thus if the intensity is found to be greater than in the recorded exposure, the distance from the anti-cathode to the body may be correspondingly increased, or else the time of exposure may be diminished. This calculation would be based upon the fact that the intensity of the source of the X-ray increases as the square of the distance at which equal illumination is produced, or in using this scale "the intensity of the

source of the X-ray increases as the square of the intensimetric number."

Dr. JOHNSTON. I would like to say, speaking of changes in fluorescence, that very careful experiments have been made in this respect, and it has been shown that the change in color and fluorescence after exposure to the X-ray is due to a chemical dehydration, and that the exposure of the fluorescent screen to moisture will rehydrate it. It regains its original color and practically the same brilliancy.

In all attempts at measurements of X-ray dosages one important thing ought never to be overlooked, and that is the personal equation. Even in Dr. Tousey's very ingenious method the personal element is of the first importance. There is the constant change in the fluorescence of the screen, and then the personal factor in the appreciation of the fluorescence.

I wish the doctor would devise a means, by which without danger to himself he can estimate the intensity. I have devised such a means in the shape of a fluoroscope that can be used without the slightest danger to the examiner. This instrument was described in *American Medicine* about six months ago. The method is simple, and I believe it to be original.

Dr. MORTON. I desire to compliment Dr. Tousey on his extremely ingenious method and the scientific spirit he has shown in devising an intensimetric scale for measuring X-ray dosages. The advantage of his method over previous attempts in this direction lies, of course, in greater stability of the indicated values.

*The following papers were read by title in the absence of the authors:*

## THE ASSOCIATION OF THE VARIOUS PHYSICAL AGENTS IN RATIONAL THERAPY

By Dr. Carlo Colombo, of Rome, Italy

Although the recent results of radio-

therapy in the treatment of malignant disease have been so brilliant, and have been the active factors in bringing physiotherapy prominently before the medical profession, yet Colombo believes that the greatest function of physiotherapy is in the vast field of incurable diseases, which are practically entirely abandoned as far as treatment by ordinary methods is concerned. In such diseases as infantile paralysis, tabes dorsalis, arthritis deformans, etc., the old *materia medica* is necessarily limited to palliative functions, to the treatment of symptoms.

Each one of the physical agents is capable of doing marvelous things in the way of disease eradication, and this fact is apt to lead one to use one or two of the physical modalities to the exclusion of the others. This tendency should be overcome, and the physician who studies physiotherapy should study all of its modalities, as, in many cases, results can be accomplished by a combination of several that cannot be attained by the use of any one of them alone.

As illustrations he speaks of the greater facility with which sciatica can be cured when thermotherapy or hydrotherapy and massage are applied in conjunction with electrotherapy. The same thing applies in acute anterior poliomyelitis; the pathological conditions involved here are as follows:

"1. Paralysis, with signs of degeneration more or less extended, more or less advanced, of the motor nerves.

"2. Disturbances of the circulation, especially venous stasis in the region of the nerves affected.

"3. Disordered nutrition, atrophy of the bone, and of the muscular masses depending on the paralyzed nerves.

"4. Alteration in and around the joints, subsequent to the alteration of elasticity and of tension of the capsule, of the ligaments and of the tendons, from which results, respectively, either excessive relaxation or stiffness of the joints."

Electrotherapy, in the form of cathodal galvanization or the sinusoidal current, will regenerate in a most gratifying manner those muscles which are not sufficiently diseased to present complete inversion of the formula of galvanic excitability. But electrotherapy does not influence the profound circulatory alteration of the trophic disorders which attack the bones.

Massage accomplishes perfectly the two-fold object of restoring the circulatory function and the nutrition of the parts.

The action of massage is greatly accentuated if thermal applications are used for 10 or 15 minutes immediately before massage.

Therapeutic exercises, more particularly those which are applied by the apparatus of Dr. Zander, are a most powerful assistant in this disease when used in combination with the above-mentioned methods.

Many electrotherapeutists feel that electricity is the only thing that is necessary or useful in the cure of acute anterior poliomyelitis, but Colombo makes the statement that no one who treats his patients by electricity alone has any idea of the total degree of improvement that can be secured in these patients, when other physical methods are combined with electricity.

Colombo urges most earnestly, therefore, that every physician who practices physiotherapy should familiarize himself conscientiously with the physiological actions and clinical capabilities of all the other methods, in order that his patients may get the benefit of all that is possible in the way of health. Special institutions where all of the modalities, electrotherapy, thermotherapy, hydrotherapy, the various methods of mechano-therapy, etc., are installed and administered by properly-trained individuals, are regarded as necessary for the attainment of satisfactory therapeutic results, as well as the minute knowledge

regarding their effects which is so necessary to the rational use of their powers.

### TREATMENT OF EPITHELIOMA BY THE X-RAY

*By Dr. J. N. Scott, of Kansas City, Mo.*

In reports of the treatment of epithelioma there has been a wide difference in the technic employed. At the present time there is not so much difference as there was a few years ago. The principal difference at the present time is in regard to the frequency of exposure. It is generally agreed that it is always advisable to use a low vacuum tube and the exposures every day, every other day, or at longer intervals, and they should be of such length of time as to produce some dermatitis but not necrosis of the healthy tissues.

In the treatment of epithelioma, as they are nearly all located in parts of the body which are uncovered, it is very important not to break down healthy tissues, because of the bad cosmetic effect due to the scarring. It is generally conceded that the cosmetic effect produced by the proper treatment with the ray is better than can be obtained by any other method, because the normal tissues are stimulated to grow and heal instead of scar tissues being formed.

There has been a great diversity of opinion on the time that should elapse between treatments. Good results have been reported in cases which received only a few treatments with long intervals between, also in cases which were treated every day.

Scott has treated a series of 22 cases of epithelioma of the face, none of which were very large. Twelve were treated every day for periods varying from 3 to 15 weeks; 9 are apparently cured, 2 improved, and one, a cancer of the lip, was a complete failure. Six were treated every other day for from 5 to 20 weeks; 4 are apparently well, 2 improved, and one failure. Four were treated every

third or fourth day from 4 to 20 weeks; 2 were apparently cured, one was treated every fourth day for 14 weeks, and improved for a while, but started to get worse again, and was put on daily treatment for four weeks; this case has been apparently well for six months. The other unfavorable case was treated every third day for 20 weeks; it was a recurrent epithelioma of the lip. The indurated parts became less in size, but would not disappear; they were then removed by a surgeon. The wound healed rapidly and the patient is now, at the end of nine months, apparently well.

From his experience with these and other cases, he believes that the quickest and best results are obtained by giving treatments every day. He applies the ray to an area about 50 per cent. larger than the apparent involvement, unless it should have to include the eye or ear. If it should and they are not involved in the growth, he covers them half of the time and exposes them the rest. He has the patient keep the eye shut if it is applied over it.

He has never damaged the eye or ear, and has treated a number of cases of epithelioma of the eyelids. The eye seems to have a resistance to the ray because it is so highly organized.

#### MANUAL THERAPY, AN INVALIDABLE AID TO THE ELECTRO-THERAPEUTIST

*By Dr. John T. Rankin, of Los Angeles, Cal.*

The author distinguishes between what he terms *specific* manual therapy and the ordinary stereotyped massage movements, rubbing and patting, of the nurse and professional masseur. The latter may well be resigned to the layman, but the former is capable of the best results only when personally administered by the trained physician, as its efficient application demands a knowledge of anatomy, physiology, and pathology which is acquired only by the experi-

enced medical practitioner. The physician should no more entrust the manual treatment of pathological conditions to one ignorant of pathological processes, than he should turn his patient over to laymen for electro-therapeutic or other treatment. Electrotherapy and manual therapy have suffered greatly because the profession in general have failed to adopt and to personally administer these remedial agents.

Not only was the progress of the system hindered by placing it in lay hands, but the physician came to regard it as beneath his dignity to administer such treatment. The professional mind, however, is changing in this respect, and we are beginning to realize that it is not at all undignified, but an evidence of the liberal code of the regular school, to personally use any agent that will benefit our patients.

Whenever the profession by negligence or apathy refrains from the personal use of helpful therapeutic adjuncts, it offers an opportunity for some gold-and-glory-seeking individual to seize upon such adjunct, as a "wonderful discovery," and to make it the basis of a special or sectarian system of practice. And because of our neglect to personally administer manual treatment there has been built up a sectarian school, whose adherents claim that their particular method is the sum total of all that is necessary in therapeutics. This fact should no more deter us from using manual therapy, which is a heritage from our medical ancestors, than should the advent of Eddyism keep us from the rational use of psychotherapy.

Intelligent people prefer to take treatment from legitimate ethical practitioners; from men with standing in their profession and community, and it is only when they cannot secure this treatment from such men, that they seek the services of the irregular. Electro-therapeutics by professional recognition and personal use is climbing from the

depths of quackery to an honorable position in the therapeutic list, and along these lines must manual therapy be rescued.

It should not be gathered from the title of this paper that manual therapy is invaluable only to the electro-therapeutist, for the worker in any branch of medicine will find great help in its use, but the electro-therapeutist is coming to be in reality a physical therapist, as he deals with practically all the physical forces in treatment, so that this system naturally falls within his province. The writer, by reference to their physiological effects, shows that electrotherapy and manual therapy are peculiarly well adapted to assist and support each other. In practice we may exert an anti-congestive action upon a congested area by the use of the proper electrical current, and we can enhance this action by manual therapy. Pain may be lessened by one agent, and this sedative action markedly increased by the other.

The two methods support each other in their actions upon spasmodic conditions. Contractions and adhesions may be more quickly corrected by the combined method. Functional derangement of any organ will generally respond much more quickly to the influence of these agents used in combination. Symptomatic treatment of organic lesions, where either of these methods is indicated, will be most successful when both are used. When one method is not well tolerated the other may supplant it with success.

The greatest value of manual therapy comes from its power to affect function reflexly through the spinal nerves and centers. It is the author's belief, that undemonstrable primary vascular and nutritive changes are of frequent occurrence in the spinal cord, and that though these changes are of a mild character in themselves, they are sufficient to create, in this delicate tissue, a condition of nerve unbalance, the manifestations of which

may, and likely will, be remote from the affected center. And conversely, that primary visceral derangements often cause a secondary instability of nerve centers with which they have connection. Working under the belief that these changes do often occur, the writer makes it an invariable rule to examine carefully for signs of such trouble, which he says are generally manifested by tenderness upon pressure over the affected center, or at the vertebral emergence of the nerves from that center. He then briefly shows how manipulation can effect these changes in nervous tissue so that normal function will prevail, and outlines a method of manual treatment in nervous dyspepsia, using this simply as an example to illustrate the application of the method which, with necessary variations, may be used with success in a large number of cases.

The paper is concluded with a plea for a thorough trial of electro-therapy and manual therapy in combination.

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The annual statement showed that the Association was in most excellent condition, its growth during the past three years having been especially marked. During this period the active membership had nearly trebled, the total number of members now being 226, the largest in the history of the Association. Whereas the Association was in debt three years ago at the present time it has a very comfortable sum to the good in the treasury. The official organ is furnished the members free of charge, and a considerable amount of money has been furnished during the last year for special committee work. The issuing of a certificate of membership without extra charge is also a development of the last three years. On the whole, therefore, the society's condition was such as to promise a large increment in its future usefulness.

The officers elected for the coming year were announced on page 261 of THE ARCHIVES for November, 1905.

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RICHARD G. BADGER, Publisher, 194 Boylston St., BOSTON

S.Tousey.

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Figure 1

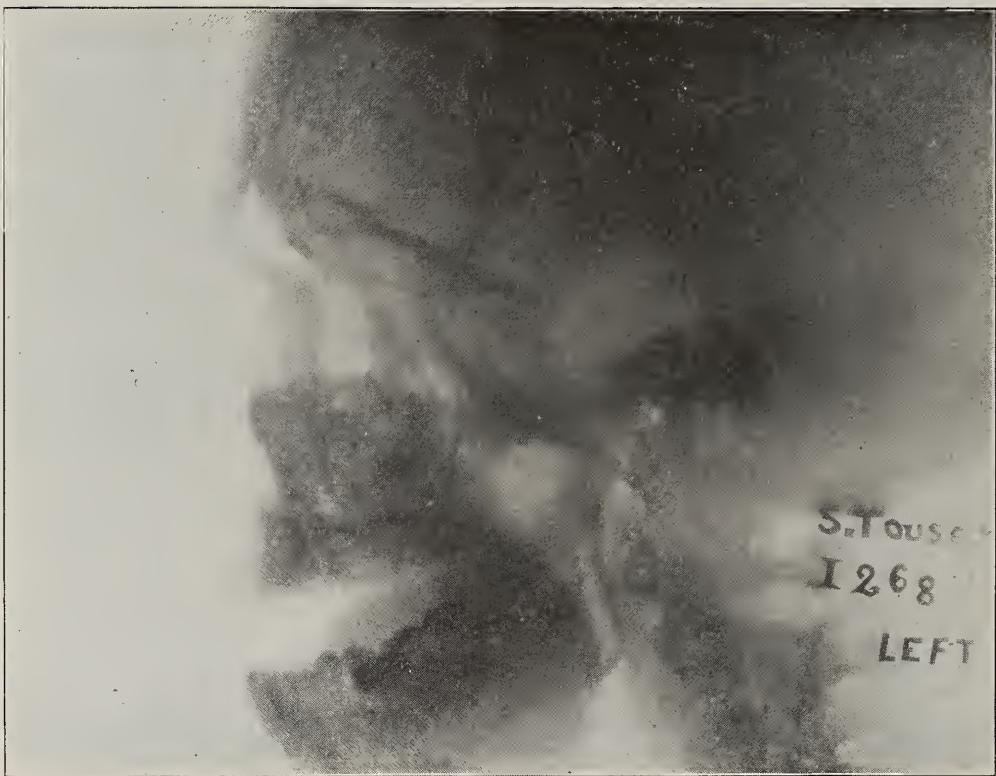


Figure 2

Figure 1. Examination for empyema of the antrum of Highmore; plate proved parts to be normal.

Skiagraphed with ray intensity \*13 Tousey, penetration 4 Benoist; anodal distance 37 cm.; exposure 60 seconds. Cramer Crown Plate.

Figure 2. Empyema of antrum; all the upper teeth had been extracted and ethmoid cells had all been scraped out.

Rays 13 Tousey, 8 Benoist: 45 cm., 60 seconds. Schleussner X-ray plate.

\* "13 Tousey" indicates the intensity of the X-ray, and means that visible fluorescence is produced in a barium platino-cyanide fluoroscope held at a distance of 13 metres from the X-ray tube. Any number in the author's intensimetric scale (See THE ARCHIVES OF PHYSIOLOGICAL THERAPY for January, 1906), indicates this distance in metres, which is practically equivalent to yards. The measurement is made under the normal conditions of office work, not when the pupils of the eyes have been widely dilated by a long stay in the dark. If this measurement of intensity is made at night, allowance should be made for the natural increase in visual perception.

Illustrating The X-Ray in Dental Diagnosis. — Tousey.  
The Archives of Physiological Therapy, February, 1906



Figure 3

Examination for empyema of antrum; proved normal.  
16 Tousey, 10 Benoist, 60 cm., 60 seconds. Schleussner X-Ray plate.

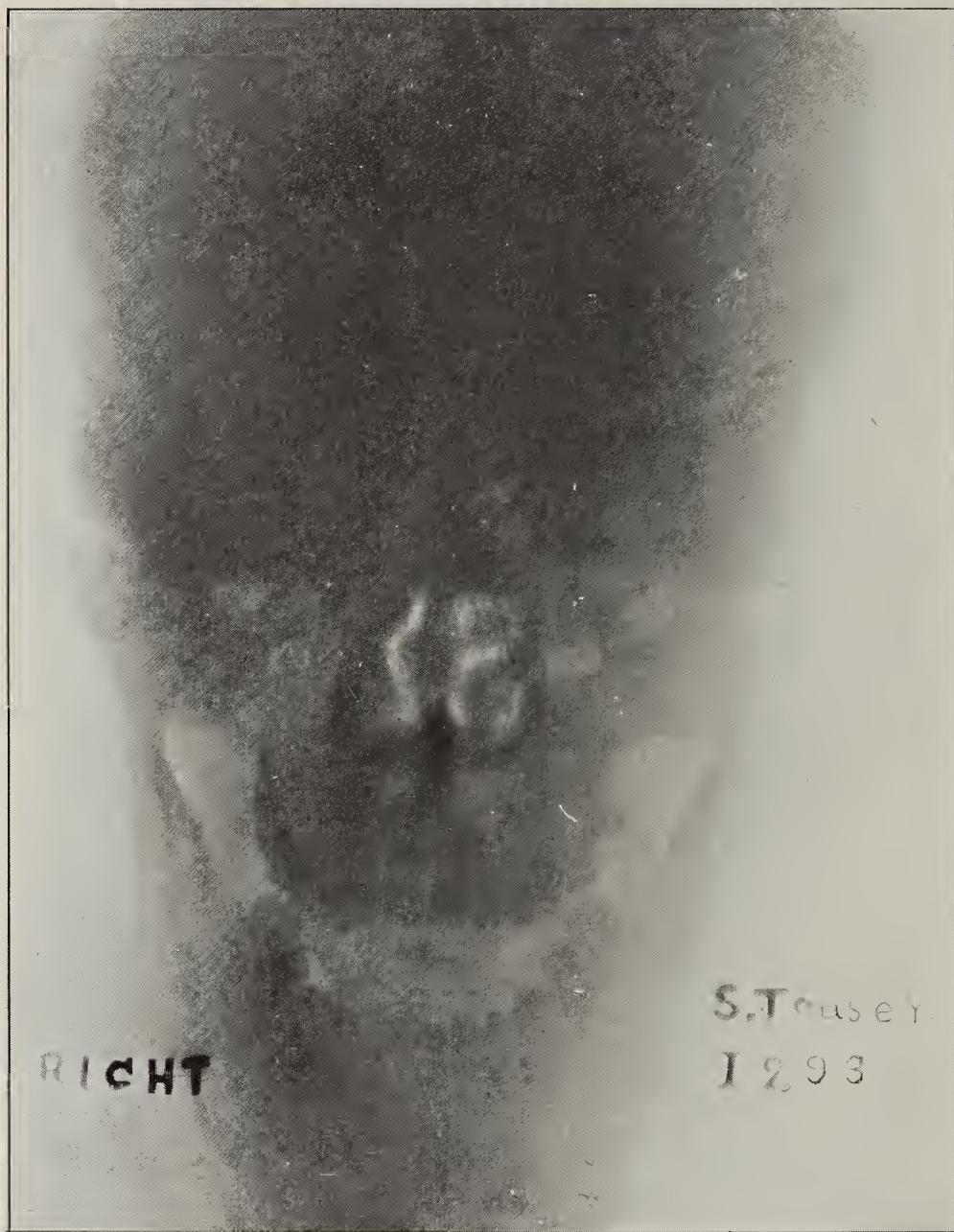


Figure 4

Empyema of antrum.

17 Tousey, 8 Benoist, 45 cm., 50 seconds. Schleussner X-Ray plate.

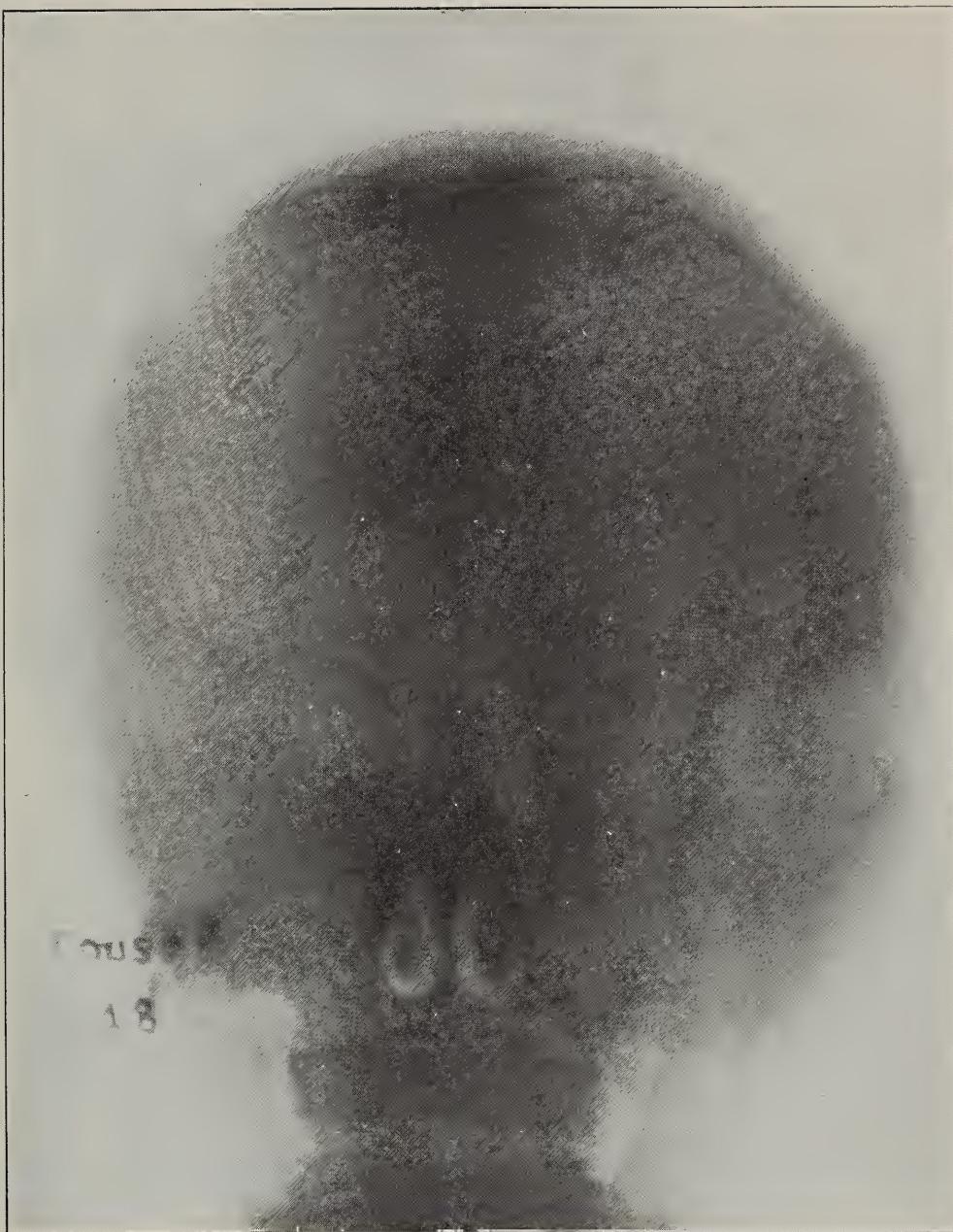


Figure 5

A case of chronic trigeminal neuralgia. Radiograph excluded the antrum, ethmoid cells and frontal sinus as the seats of trouble; upper and lower sets of false teeth in position.

12. Tousey, 5 Benoist, 51 cm., 30 seconds.



Figure 6



Figure 7

Figure 6. Stereoscopic radiographs of normal inferior maxilla, gold crowns, etc. Intensity 12 Tousey, penetration 4 Benoist, 32 cm., 40 seconds. Cramer Crown Plate.

Figure 7. Stereoscopic radiographs for examination of antrum (found normal). 13 Tousey, 5 Benoist, 35 cm. Cramer Crown Plate.



Figure 8



Figure 10



Figure 9



Figure 11



Figure 12

*Figure 8.* Normal second bicuspid and first and second lower molars.

Tousey's vertical film-carrier, intensity 8 Tousey, penetration 4 Benoist, 25 cm., 20 seconds. Eastman positive cinematograph film.

*Figure 9.* Impacted lower wisdom tooth.

Mueller tube No. 13 exhibiting spark resistance of six inches, and giving off rays of intensity 13 Tousey, penetration 9 Benoist, anode 25 cm. from plate, using 10 amperes of primary current, and Caldwell interrupter. Seed triple-coated process film.

*Figure 10.* Unerupted second lower bicuspid tooth.

Wappler 12-inch coil, Caldwell interrupter, Tousey's horizontal film-carrier, 11 amperes primary, 2 milliamperes secondary current, spark-equivalent 12 cm. Intensity 12 Tousey, penetration 8 Benoist, distance 25 cm., time 20 seconds. Seed double-coated non-halation film, M. Q. Developer.

*Figure 11.* Unerupted upper canine and first and second bicuspid teeth.

Tousey's horizontal film-carrier, 6 Tousey, 3 Benoist, 25 cm., 25 seconds. Seed double-coated non-halation film.

*Figure 12.* Lower central incisors, temporary persistent, germs of permanent centrals absent, unerupted canines present.

Tousey's horizontal film-carrier, 11 Tousey, 7 Benoist, 25 cm., 10 seconds. Seed double-coated non-halation film.



Figure 13



Figure 15



Figure 14



Figure 16



Figure 18



Figure 17



Figure 19

*Figure 13.* First and second lower molars and first bicuspid and canine; second temporary molar had been extracted without taking a radiograph, which would have revealed the absence of the germ of the second bicuspid; apparatus in operation for closing the space.

Wehnelt interrupter, 10 amperes primary, 6 milliamperes secondary current; 13 Tousey, 3 Benoist, 25 cm., 20 seconds. Eastman positive cinematograph film.

*Figure 14.* Temporary upper second molar persistent but quite loose, germ of permanent second bicuspid absent.

Rays 12 Tousey, 9 Benoist, 25 cm., 20 seconds. Eastman positive cinematograph film.

*Figure 15.* Subject from which Figure 14 was taken.

Tousey's horizontal film-carrier, 12 Tousey, 9 Benoist, 25 cm., 30 seconds. Seed double-coated non-halation film.

*Figure 16.* Examination for unerupted upper canine, germ found to be absent.

Wappler 8-inch coil, Caldwell interrupter, 4 amperes primary current, 10 Tousey, 4 Benoist, 25 cm., 30 seconds. Eastman positive cinematograph film.

*Figure 17.* Upper central incisors and left lateral. Left central the seat of a cavity beyond the margin of the gum which had been filled a year previous, but there remained indefinite discomfort which was found to be due to a very great extension of the cavity.

12 Tousey, 4 Benoist, 25 cm., 20 seconds. Seed triple-coated process film.

*Figure 18.* Crown and bridge-work abscess about roots of upper central and lateral incisors, fistula opened two inches away.

10 Tousey, 7 Benoist, 25 cm., 20 seconds. Eastman positive cinematograph film.

*Figure 19.* First, second, and third lower molars, a supernumerary tooth, and second bicuspid; pocket about the posterior root of first molar.

Tousey's vertical film-carrier, 12 Tousey, 4 Benoist, 25 cm., 20 seconds. Eastman positive cinematograph film.

*Illustrating The X-Ray in Dental Diagnosis.—Tousey.*

*The Archives of Physiological Therapy, February, 1906*

# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

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## THE X-RAY IN DENTAL DIAGNOSIS

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THE X-ray may be used either for radioscopy or skiagraphy, and the latter may be either single or stereoscopic. The necessary materials include an X-ray coil, an X-ray tube, a suitable stand, an efficient tube shield (I prefer the Friedlander), photographic films and plates, two or three models of fluoroscopes, and plate and film carriers.

The examination may be made for the study of the minute anatomy of the teeth and the alveoli or tooth sockets, in which case a film or fluoroscope is used which may be placed inside the mouth. Or it may be for the study of the jaw bones, or the antrum or the other accessory sinuses, to which inflammation and suppuration sometimes extend. For this a plate is placed either at the side of the face or in front, while the tube is diametrically opposite. The X-ray shines through the entire thickness of the head or face to cast an image upon the plate. Stereoscopic pictures are excellent for these cases. The X-ray may be used in case of unerupted natural or supernumerary teeth to determine their presence, position and size, or what is equally im-

portant in some cases, the absence of such teeth. In these cases the film is usually placed in the mouth, but sometimes, as in the nasal tooth, a plate at the side or in front shows better when the tooth is in a position far removed from the natural one.

Taking up the consideration of the apparatus and materials to be employed, these cases require very considerable power, and in the author's experience a quality of ray giving marked contrast. A twelve-inch coil with a Caldwell interrupter permitting the flow of nine amperes of primary current, gives excellent results. A Wehnelt interrupter sometimes produces a larger secondary output with a smaller primary current and more rapid interruptions. A smaller coil, even as small as a six-inch coil, may be constructed with special reference to a large output; for instance so as to send three or four milliamperes of current through an X-ray tube with an equivalent spark-gap of two or three inches.

With skillful manipulation, a smaller coil will answer for practically all cases, except those requiring the penetration of the ray through the entire thickness of the head, from behind forward. As to

the degree of penetration opinions vary. There is no doubt at all that for a fluoroscopic examination a low degree of vacuum, perhaps three or less of the Benoist scale, is absolutely necessary. Looking at the little fluoroscope held inside the mouth, with a moderately high degree of penetration, there is so little contrast developed that it is difficult even for an expert to make out the roots of the teeth, while with a low degree of vacuum, but of course with the necessary power, or intensity, or brilliance, the roots of the teeth may be demonstrated even to an on-looker, and the presence of an unerupted tooth, or the position of an impacted wisdom tooth can be seen at a glance.

The finished pictures and some lantern slides which have been made with a high degree of vacuum show beautiful detail, but they do not reproduce as well in half-tone engravings as the pictures made with a low degree of vacuum, and showing, therefore, a greater contrast.

As to the power or intensity of the ray, there is no better measurement than the one suggested by the present author, which consists in finding out what distance the X-ray will carry and produce visible fluorescence in an ordinary fluoroscope. Unless you can go to a distance of from 12 to 15 metres or yards, and still be able to tell the difference between the appearance of the fluoroscope when the X-ray is turned on, and when it is turned off, you are working with a ray whose intensity is not great enough for the best results. Intensity 12 to 15 Tousey is the way I express it.

The author's dental fluoroscope is shaped like a mouth mirror, and may be placed inside of the mouth in such a position that the X-ray from a tube placed near the affected side of the face casts a shadow or image on the fluoroscopic surface. To make this examination successfully, the room must be practically or entirely dark, but it is not at all necessary that it shall be Egyptian darkness. It is

wise, however, to have the ordinary light from the X-ray tube excluded by covering the tube with some black material. This is a successful method for the fluoroscopic examination of cases of suspected unerupted teeth and of impacted wisdom teeth. It does not give sufficient detail for the study of the root canals of the teeth or for the study of the condition of the bone about the apices of the roots. In making this examination the barium-platino-cyanide surface is toward the teeth and the operator looks at this surface, not through the thickness of the screen as is usual with an ordinary fluoroscope. The ray should have intensity, 10 Tousey; and penetration, 3 Benoist.

For fluoroscopic examination of the jaw, as in cases of fracture, the X-ray should be of great intensity (12 Tousey) but the degree of vacuum may be medium or high (6 to 12 Benoist). One should not expect to make out the details of the condition of the teeth by this method. A magnifying fluoroscope devised by the author and shaped like a jeweller's magnifying-glass, gives excellent detail of the structure of the bone. At the large end it is closed by a piece of fluoroscopic screen  $2\frac{1}{2}$  inches in diameter, the metal case is  $4\frac{1}{2}$  inches long and is provided with a lens and a flaring eye-piece which fits closely over one of the operator's eyes and excludes ordinary light. Fractures and the condition of the lower jaw after wiring or other operative treatment may be more clearly seen than in the ordinary large fluoroscope. Of course it must be remembered that the operator's face is correspondingly nearer to the X-ray, and that such examinations should not be made too frequently or be unduly prolonged.

The regular large fluoroscope is excellent for the study of conditions of the antrum, the ethmoid cells and frontal sinus, and by having the mouth open and the head turned to one side so that the

images of the two sides of the face do not overlap, the teeth may be studied. The various pneumatic sinuses are best observed with the tube directly behind the head and the fluoroscope in front. The intensity should be great (12 or 15 Tousey), and the degree of penetration equal to about No. 10 Benoist, or about 10 thicknesses of tin-foil weighing an ounce to a hundred square inches. The image obtained is better than that seen by transillumination by an incandescent lamp placed inside the mouth, and is of the whole face, but it is suitable only for a momentary glance. Any real study of the fluoroscopic appearance would involve risk of injury to the patient. A radiograph of this character could be made with an exposure of less than a minute and can be studied in every detail without danger, and may be compared with the pictures of other cases in which the diagnosis has been verified by operation.

The fluoroscopic examination then, should be a momentary glance to determine whether it will be necessary to make a radiograph. It is only to be made by an operator who is very familiar indeed with the normal and pathological appearance of the pneumatic sinuses. The powerful ray required makes it imperative to strictly limit the time of exposure.

Radiographs of the teeth are best made on small films held inside the mouth, and the author has devised a set of film carriers (see *THE ARCHIVES OF PHYSIOLOGICAL THERAPY* for September, 1905), for the different parts of the dental arch by means of which the films may be held in position by simply closing the mouth upon the aluminum carrier. This is much more pleasant and safe than holding the film by one of the operator's fingers in the mouth. The film should be made with special reference to fineness of grain and density of image. The matter of speed is of no consequence at all, and the films

which have the desired qualities are generally made with a very slow emulsion. A very good film indeed is made by the Eastman Kodak Company under the name of positive cinematograph film. It is sixty times as slow as the regular kodak film and is manufactured especially for moving pictures. The pictures of moving objects are originally made upon the negative cinematograph film which has the same sensitiveness as the ordinary kodak camera film, and are then printed upon the positive film for use as a transparency for lantern demonstrations. Another good film is made with a process emulsion by the Seed Dry Plate Company. Double or triple coated films with either a rapid or a slow emulsion give excellent density but are lacking in fineness of grain, and so do not show the great detail in the structure of the bone required in dental work.

Bromide paper with an enameled or glossy surface can be used for dental radiography and gives excellent results in gross lesions like supernumerary teeth or unerupted teeth. It is difficult, however, to obtain fine enough detail for the study of the majority of dental cases. This paper is less sensitive to light than a film, requires an exposure about four times as long, but can be developed in any moderately darkened room. It does not require the exclusion of all ordinary light or the use of a ruby lamp as is necessary for the development of a film; and it has the very great advantage of producing a finished picture within a few minutes.

There is divergence of opinion as to the best wrapping for films which are to be placed inside the mouth. Some operators place the films between two sheets of what is called black palate rubber by the dentist and cut all three into packets of the proper size, pressing the cut edges of the rubber together over the edges of the film. The rubber is adhesive and forms a completely

waterproof covering for the celluloid film, and offers considerable protection against ordinary light while quite transparent to the X-ray. A piece of bromide paper may be placed over the sensitive surface of the film, serving to protect it from contact with the rubber and enabling one to get a bromide print at once. This is a sort of proof which shows whether the film was held in just the right position. The present author, however, uses packets in which two films of the proper size and shape are wrapped in black paper with an outside envelope of paraffin paper. Packets containing films of the correct size are sold by the Eastman Kodak Company all ready for use. These measure  $1\frac{1}{4} \times 1\frac{5}{8}$  inches. Other sizes may be made to order.

The plates which are used for taking radiographs through the entire thickness of the head in dental cases may be of the sort called X-ray plates and which are usually made with a slow emulsion; but the author has had equally good results with the best quality of the rapid plates used for ordinary photography. Such are the Cramer Crown plates. Among the best X-ray plates are those made by Cramer and by Seed in this country, and by Schleussner in Germany. Some of the author's best pictures of this class have been made with the Schleussner plate, but this may have been a coincidence.

Stereoscopic radiographs of this type are very easily made with a suitable plate-holder such as the one made by Kny and Scheerer, from which the first plate can be withdrawn and a second plate inserted without raising the patient's head which rests on the plate-holder. The first picture having been taken and the X-ray tube moved transversely about three inches, the second plate is inserted and the second exposure made with a ray corresponding as closely as possible with that used for the first picture. A suitable tube stand en-

tirely of wood is made by Wappler. It has a horizontal arm which can be raised or lowered without any screws, having a counter weight just as a window has. The horizontal arm moves backward and forward through a groove without any fastening or unfastening. The tube is held in a clamp which may be securely screwed in any position.

A lateral view through the entire thickness of the face, as in Fig. 1, which proved to be normal, shows the frontal sinus with the infundibulum leading to it from the nasal fossa, but does not show the antrum as well as an antero-posterior view. In the lateral view one antrum is more or less obscured by the superimposed shadow of the other, so that it would not be possible to make an absolute diagnosis of disease of one particular antrum from a single lateral picture. Such a picture is shown in Fig. 2, in which there was pus in the antrum on the side nearest the plate, and before this was discovered by means of the X-ray all the upper teeth had been extracted and one or two operations done upon the jaw and upon the ethmoid cells for the relief of the pain which was the marked symptom of the case.

A first-class antero-posterior view of the face in such a case shows at once which antrum is diseased, and to what extent the trouble has extended to the ethmoid cells. It shows on what side, if any, the frontal sinus is affected. The lateral view is the only one which will satisfactorily show the condition of the sphenoidal cells. The exposure should be intensity 15 Tousey; penetration 10 Benoist; distance 45 cm.; time 50 seconds.

A picture taken on a film held inside the mouth ought to show the entire extent of the roots of the teeth, the pulp cavities and the root canals, the layer of enamel on the crown of the teeth, the peri-dental membrane or layer of compact bony tissue lining the alveoli or

tooth sockets, and the structure of the surrounding bone. One reason for which such a picture is commonly required is the persistence of temporary teeth after they should have been lost and replaced by permanent teeth, in which case the examination shows whether the germ of the permanent tooth is present or not. The question arises sometimes as to whether a tooth is a temporary or a permanent tooth; the radiograph decides this question, and if it is a temporary tooth it shows whether or not the permanent tooth is to be expected, to what extent absorption of the temporary tooth has taken place and how long it may be expected to remain in the mouth.

A wisdom tooth growing in a more or less horizontal position, impacted as it is called, will often cause pain and swelling by pressure upon the second molar tooth in front. This trouble sometimes arises several years before the wisdom tooth erupts or becomes visible through the gum. Such a picture is shown in Fig. 9. In this case the wisdom tooth was removed by chiseling through the thin shell of bone which covered it.

Sometimes an unerupted tooth, either normal or supernumerary, causes trouble by pressure upon a neighboring tooth, the trouble taking the form of a displacement of the tooth, or the production of a pocket. The latter is the technical term for an absorption of the alveolus and the formation of a deep cavity along the root of the tooth into which food and other contents of the mouth find their way and which it is absolutely impossible to keep aseptic; such a condition is clearly shown by the X-ray and was found in Fig. 19.

An alveolar abscess in its incipiency is seen as a transparent zone of absorption about the apex of the root, and the same condition continues as long as the trouble is unrelieved. Fig. 18 is of a case in which a fistula opened near the middle of the roof of the mouth and while there

were several teeth under suspicion the X-ray at once located the seat of the trouble which proved to be at about the farthest possible point from the orifice of the fistula.

The extent to which absorption of an implanted tooth has taken place can be determined, and also the condition of the root and the neighboring alveolus in the case of teeth which are held in place by, or which form the anchorage for crown and bridge work.

The condition of the antrum is discoverable by means of a picture taken upon a film held inside the mouth, providing the picture is taken in the region above the roots of the molar and bicuspid teeth.

A pulp-stone, or calculus, forming in the pulp cavity or root canal would probably be discoverable by means of the X-ray.

The condition of root fillings is readily shown; whether the filling extends to the apex of the root or whether the instrument has perforated the root and the filling has been forced out into the neighboring tissue. The latter sometimes occurs and is the source of very serious trouble.

A cavity in a tooth shows as an area of transparency, and sometimes when occurring beyond the gum margin it may be discovered and treated sooner than would have been the case without an X-ray examination. This may result in saving a valuable tooth.

Necrosis of the jaw as of any other bone is indicated by unnatural transparency, and requires some little familiarity with the normal appearance to enable one to recognize it.

The films should be held as nearly parallel to the long axis of the teeth as possible. In the case of the lower jaw this is very easy, but in the case of the upper jaw it is more difficult and so far it has seemed better to press the film against the roof of the mouth and inside of the teeth, and place the tube at a

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correspondingly higher level, so as to make the image of the teeth upon the oblique plane of the film about the actual length of the teeth. These same pictures may be made upon a horizontal projection by placing a large film horizontally in the mouth, it being held there by closing the lips and teeth upon it. The film may be in a little film carrier of the author's with an indicator so adjusted as to point directly to the place where the anti-cathode of the tube may be, in order to produce an accurate image of the teeth upon this horizontal plane. Then again there are special film carriers of the author's for the upper teeth which hold the film in a vertical plane.

The only special points about the development of dental radiographs is that

the film or plate should be slowly and fully developed so as to bring out every detail in the part of the film or plate least affected by the X-ray; for instance, where the X-ray has had to traverse not only the bony tissue of the jaw, but also the denser tissue of the tooth we wish to have the films sufficiently developed to show the root canal. In making prints from these films, or plates, on the other hand, the exposure should be comparatively light so as not to obliterate all these details by making the print from black mass. Where double or triple-coated films are used long slow development is especially essential so as to permit the deeper layers of the film to be developed by the chemical solution before the more superficial layer is overdeveloped and fogged.

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## THE REGULATION AND MEASUREMENT OF THE THERAPEUTIC DOSE OF THE ROENTGEN RAY \*

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THE Roentgen ray should no longer be looked upon as an empirical therapeutic agent or a magic light that acts by virtue of its august and mysterious presence. It is simply a newly discovered form of energy, governed by natural laws, regulated by artificial agencies and having a specific physiological action.

In regulating and measuring the ther-

apeutic dosage all the factors concerned in the production of the ray as well as its physiological action must be taken into consideration.

Of the factors concerned in the production of the ray with each individual outfit some are fixed and some are variable. Among the fixed factors are the winding of the primary and secondary coils, the character of the interrupter, and the distance between the cathode and platinum disc of the tube. The variable factors are the currents supplied to the primary, the speed of the interrupter, the resistance in the secondary

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\*Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Md., September 28-30, 1905.

circuit, the degree of the vacuum of the tube, the distance of the tube from the surface to be exposed, the duration and frequency of the exposure.

Since it is the variable factors alone which are capable of regulation with each outfit these only will be considered. These variable factors must be combined in the proper manner to bring about a desired result.

For our purposes in medicine and surgery the ray may be said to have three properties; first, a penetrative property; second, a property to affect photographic plates; and third, a property to affect living organic matter, which property might be called the physiological efficiency. These three properties do not vary in the same proportion, but are governed by different combinations of the factors. It is the first and chiefly the third with which we have to deal in therapeutics.

The penetrative property is in direct proportion to the resistance in the secondary circuit and this is regulated by the vacuum of the tube and the resistance due to the spark-gaps in series or the resistance regulator.

The third, or the property to affect living tissues, is to a certain extent in proportion to the energy given off from the tube. The energy according to the law governing all forms of radiant energy varies inversely as the square of the distance. The physiological efficiency of the ray seems to depend more upon the degree of energy than upon the quantity of energy and therefore cannot be in direct proportion to the energy. This is more apparent in the bactericidal influence: One strong intense exposure may destroy bacteria; whereas a number of weaker exposures will not do so, although the total amount of energy may be the same. We see this exemplified in the treatment of lupus and other parasitic diseases. The principle is analogous to the coagulation of albumen by heat. Albumen only coagulates when

heat is applied at a certain degree. It is the degree of heat and not the total quantity of heat applied that coagulates; or to use another analogy numerous small blows will not accomplish the result that one strong blow will, notwithstanding the fact that the total amount of energy may be the same.

The physiological efficiency or the influence of the ray upon the tissues is determined by experience and the microscopical study of the tissues exposed. The effect seems to vary from stimulation to complete abolition of the vital principle and the changes incident thereto. The exact nature of the ray we do not know. Perhaps if we knew the forces that keep in motion the sub-atoms or animate a mass of protoplasm we would find the Roentgen ray akin to them.

The action of the ray upon living tissues seems to be a dynamic one, that is, it influences the vital force and does not influence the cells or tissues as do mechanical, chemical, or other physical agents such as heat. There seems at first to be an increase of the vital principle then a cessation; or first stimulation then destruction. Since the cells are the elements wherein resides the vital principle which is influenced by the ray, we readily see that a tissue is affected in proportion as it has cells. Also the more vital principles the cells contain the more does the ray affect them. Since the vital principle is more active in cells nearer to the embryo we can now perhaps explain why the ray has a selective effect upon the spermatozoa and ova, and the cells of a malignant growth which are embryonal in character. Next in the order of their relative proportion of cells are the epithelial tissue of glands, hair follicles and the skin, and lastly connective tissues and muscles. The effect upon the last two tissues may be secondary due to the inflammatory processes initiated by the destruction of the cellular elements. The cells are deprived of their

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life, they now act as foreign bodies and disintegrate bringing about phagocytosis infiltration of round cells and proliferation of the endothelium of the blood vessels and the consequent interference with the circulation which causes a degeneration of the muscles and connective tissue.

Although the physiological efficiency may not conform entirely to the law of varying inversely as the square of the distance it is the nearest guide we have at present to direct us in regulating the time and distance properly and in establishing a technic by means of which deep growths can best be affected without destroying the overlying tissues. As a rule the more superficial the effect desired the closer should the tube be placed to the surface.

It is very important that the operator should know the dose that will produce an erythema. It is only by this knowledge that he can intelligently treat any case.

By experience I have found that about ninety minutes is required to produce an erythema on a surface ten inches from a tube of medium penetration, a spark-gap of four inches equivalent to the resistance in the secondary circuit, and the milliammeter reading three-quarters of a millampere.

With this knowledge and the law of the inverse squares I have constructed a table published in Medical News, N. Y., March, 1904, to show the safety limits at various distances. The safety limits are about 30% less than the number of minutes required to produce a decided erythema. The table also shows the relative intensities at different distances so that if a number of exposures are given at different distances they can be reduced to the equivalent of a common distance and the total number of minutes then added.

We thus readily see how the law of the inverse squares helps us in regulating the duration of the exposures and the

distance of the tube from the surface.

Distance.	Relative Intensity.	Safety Limits.	
2	1	1,000	25.00
4	1/4	.250	6.25
6	1/9	.111	2.77
8	1/16	.062	1.56
10	1/25	.040	1.00
12	1/36	.027	.69
14	1/49	.020	.51
16	1/64	.015	.39
18	1/81	.012	.30
20	1/100	.010	.25

Upon it is based the technic of attempting to reach deep growths.

The difficulty in reaching them has been the danger of injuring the superficial tissues before the deep growths are affected. Now we know it is not necessary to bring about a necrotic inflammation to destroy a cancer. If we can have the rays penetrate the tissues with moderate uniformity we can then hope to destroy the deep growths. The closer the part is to the tube the greater is the difference in the effect upon the skin and the part beneath. For instance, suppose we have a growth four inches from the surface and the surface four inches from the anode: According to our table the effect on the skin would be represented by .250 and that on the growth .062, or a difference of .188. Of course this does not take into consideration the loss of intensity or quality due to penetrating the tissues. If the surface of the skin be placed at eight inches the growth will be at twelve; the relative effects will be .062 and .027, or a difference of .035. With the skin at sixteen inches

4"	.250	.062	.015
4"	Diff. .188	Diff. .035	Diff. .005
	.062	.027	.010

and the growth at twenty the relative effects are .015 and .010, with a difference of .005.

We thus see that the further the part is from the tube the less is the difference between the effect on the skin and the part beneath. We should therefore place the part far off and make due compensation by increasing the duration of exposure directly as the square of the distance, or by referring to the table one can determine the duration for the exposure. My rule is not to expose in ten days more than the number of minutes required to produce a dermatitis. I usually give a treatment in series of four to six exposures each, in which the sum total number of minutes equals the number of minutes required to produce the desired effect.

The more accurately an operator can determine his dosage the fewer need be the number of exposures.

In regard to the regulation of the physiological efficiency by means of the other variable factors the most important of these are the interrupter and the current supplied to it. The secondary current is directly related to the number of interruptions and the current supplied to the interrupter.

Since, however, it is possible to have a current going through the primary and no current going through the secondary on account of a high degree of vacuum of the tube it is apparent that the primary and secondary currents are not in direct proportion. Therefore the reading of the ammeter in the primary circuit will not be an accurate index to the current flowing in the secondary, which at present is the best index to the energy given off from a tube and consequently the physiological efficiency of the Roentgen ray.

Thus we see that the two factors directly and immediately concerned in the production of the radiant energy of the tube are the current flowing in the secondary circuit and the resistance in the

secondary circuit due to the vacuum of the tube and the inserted spark-gaps. The current flowing in the secondary is measured by the Roentgen milliammeter. The resistance in the secondary circuit is measured by the length of the spark-gap between the terminals on the coil and not the gap between the terminals of the regulating apparatus of the tube which is an index only to the resistance offered by the vacuum of the tube.

The spark-gap measures the resistance in the secondary circuit which gives to the ray the quality of penetrability; the milliammeter measures the flow of current which gives the energy to the ray and the two combined give the physiological efficiency.

There is an inverse relation between the resistance in the secondary circuit and the current flowing through it. The more the resistance the less the current and vice versa. Since we might say that the penetration is dependent upon the resistance and the radiant energy upon the current, the more the penetration the less the energy and the less the penetration the more the energy. This is confirmed by the milliammeter and by the fact that low vacuum tubes burn more readily, or in other words have more physiological efficiency.

Now, to sum up: the physiological action of the ray is due to its influence upon the animating force called the vital principle and varies from slight stimulation to complete destruction. The vital principle resides in the cells of the tissues. A cell is affected in proportion to its vital principle. The vital principle is in proportion to the nearness of the cells to the original embryonal cell. A tissue is affected in proportion to the relative number of the cells it contains. The physiological action is dependent upon that property of the ray called the physiological efficiency. The physiological efficiency is the result of the combined radiant energy and the penetrability. It is, therefore, to a cer-

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tain extent, subject to the law of varying inversely as the square of the distance. This may not be wholly true because certain effects are at least dependent upon the degree of energy rather than the total quantity; on the other hand since the results of the day do not reach the maximum effect until several days or weeks after the exposure the successive application is undoubtedly cumulative.

The penetrability is regulated by the resistance in the secondary circuit and is measured by its equivalent spark-gap. The radiant energy from the tube is governed by the current flowing through the secondary circuit and is measured by the milliammeter. Therefore, to measure and record a dose of the Roentgen ray there should be noted: the duration of the exposure, the distance of the surface from the platinum disc, the equivalent spark-gap and the reading of the milliammeter.

## DISCUSSION

Dr. RUSSELL H. BOGGS (Pittsburg) believes that not sufficient attention is paid to the fact that the light decreases inversely as the square of the distance. The time of exposure also depends largely on the apparatus used, because the milliammeter does not read the same with different apparatus used on the same current.

Dr. KENNON DUNHAM (Cincinnati) directed attention to some work done by

Professor Geyer of Cincinnati, who showed that mild radium rays stimulate the activity of animals exposed to them.

Dr. M. K. KASSABIAN (Philadelphia) said that the action of the rays differs in proportion to the susceptibility of the patient. Some patients are very susceptible to the rays while others are not, and can be treated indefinitely without being burned. Furthermore, the penetration of the rays depends on the vacuum of the tube, and not on the amount of current going into the tube. He also referred to the use of fluorescent paper and substances in capsules for measuring the dosage of the ray.

Dr. GEO. C. JOHNSTON (Pittsburg) explained why the measurement of the dosage of the ray by means of fluorescent substances is incorrect, pointing out that the re-action is due entirely to dehydration. The results obtained depend largely on the personal equation of the operator. The attempt to insert in the tube circuit a meter is also beset by many difficulties. The meter simply shows the load the tube carries, but it does not measure the efficiency of the tube as a transformer.

Dr. G. P. GIRDWOOD (Montreal) has attempted to establish a unit by using varying thicknesses of lead foil. However, in order to get a unit of measurement it is necessary to consider the current, the apparatus, and the susceptibility of the patient as well as the personal equation of the operator.

## EDITORIAL

## IRRATIONALITY IN ROENTGEN RAY TECHNIQUE

A STUDY of the current literature of physiological therapy cannot but lead to the conviction that a large proportion of the men who are employing these agencies today, are woefully in need of enlightenment as regards their physics and physiological influences. They are appallingly and unjustifiably behind the times; appallingly, because of the pitiful paucity of beneficial results which character-

izes an incorrect, hence inefficient technique, unjustifiably, because access is easily obtained to the writings of hundreds of men of reputation who have carefully recorded and elucidated the exact technique by which beneficial results may be attained, and whose statements are susceptible of ample proof.

This unfortunate state of affairs is particularly noticeable in connection with the therapeutic use of the Roentgen ray, probably because such a multitude of men are at present attempting the therapeutical application of this force, and because it is a force which refuses more obstinately to yield its healing powers to, and resents more viciously, unskillful manipulation than almost any other.

An article by a well-known surgeon which appeared in a recent issue of one of our best medical journals illustrates this to a nicety. The surgeon-radiologist, who is evidently, like most surgeon-radiologists, a better surgeon than radiologist, treated a series of cases of carcinoma of the breast with low and high tubes placed at distances of from six to ten inches. His results were unsatisfactory, microscopical examination of the exposed tissues which were removed by subsequent operation, showing that only superficial histological effects, or no effects at all, had been produced.

Any other result could hardly have been expected when it is remembered that, as has been stated many times during the last three years in radiological literature, only those radiations are effective which are absorbed, and that with a high tube at a distance of six inches practically all the radiations would pass through a mammary tumor and fail of absorption; it is rather to be wondered at that the patient so treated did not sustain a dermatitis upon her back.

In some of these cases a low tube was employed at as irrational a distance, the result being a dermatitis and a marked superficial effect. X-ray intensity diminishes as the square of the distance, hence, with a tumor of the breast, lying as deep as three inches below the skin, how could one expect to produce at a distance of nine inches, an effect equal to that produced at a distance of six inches, the square of six being thirty-six and the square of nine eighty-one? The only rational way to treat such a tumor would be to protect the skin (unless a superficial ulceration was present which it was desired to affect) by a sheet of sole leather (as recommended by Pfahler of Philadelphia), and then, with a tube placed at a distance of eighteen or twenty inches, expose the entire breast, axilla, and supra-clavicular regions

for a period of thirty minutes, using a tube giving off rays of medium penetration.

This author is unable to understand why, with a low tube at a distance of six inches, he obtained some remarkably beneficial effects upon carcinoma recurring after operation, whereas the fact is that he had been using a technique beautifully adapted to the treatment of carcinoma in just this and no other situation.

The fact that the radiation from a Crooke's tube has the power to inhibit the growth of carcinomatous tissue wherever situated, or to cause its disappearance and replacement by connective tissue has been established beyond cavil, and it has also been established that the production of this desired result does not follow the exhibition of this agent except where it is applied strictly according to physical and clinical laws with which every experienced radiotherapist is thoroughly familiar.

Unlike the articles from most surgeon-radiologists, the technique employed by this author was sufficiently described to make it at once apparent to the properly-qualified radiotherapist, why his experience was so unsatisfactory and unfortunate; but the deplorable fact remains that attention and credence are given to such records by the general profession, if so be they are made by a physician or surgeon of reputation and are published in a journal of approved standing. They induce an unjust, untrue, and unfortunate mental attitude in the general practitioner, which results in thousands of sufferers failing of benefit which they might otherwise obtain, and by influencing receptivity adversely, hinders greatly the general dissemination of knowledge regarding the actual curative and palliative limitations of this agent. Again, such statements from such men who, after a complacent survey of a series of failures, blandly announce that they have proven to their own satisfaction that this agent is incapable of producing histological changes which have been repeatedly demonstrated to follow the proper application of the ray in the hands of a large number of competent observers, are calculated, and in some cases perhaps designed to cast discredit upon the judgment, powers of observation, and veracity of men who have devoted years of careful, earnest work to elucidating the correct and successful method of applying the Roentgen ray therapeutically.

As regards properly-qualified general opinion concerning the technique described in the above-mentioned article, the American Roentgen Ray Society, which is undoubtedly the court of last appeal upon radiotherapeutical

matters in this country at least, is a unit in support of the fact that such pathological conditions can only be influenced and the skin at the same time preserved from injury, by locating the tube at a proper distance; *i.e.*, a distance at which the degree of effect of the rays upon the skin will be practically the same as upon the deeper-lying structures, and this is readily ascertained by bearing in mind that X-ray intensity varies as the square of the distance. Prof. E. G. Williams of Richmond, Va., reduced the principles involved to tabular form over a year ago, and published the same in the *Medical News* for March 26, 1904. This article was extensively abstracted and the table, which causes the adjustment of tube distance, time of exposure, etc., to become a matter of little difficulty, widely disseminated. It would hardly seem probable that one who was studying radiological literature as closely as one should who is practicing radiotherapy could have overlooked it, and still more incomprehensible that the principles involved therein should have been disregarded if the article had been read.

Conclusions which apparently contradict accepted facts must be based, in order to command credence, upon a series of cases numbering hundreds instead of a dozen, and the technique employed must be that commonly used in securing commonly-accepted curative results. Otherwise it would be just as logical to condemn the knife in appendicitis, because the results obtainable by a medical student in a tenement-house kitchen without asepsis did not show the same proportion of recoveries as when the operations were performed in a properly-equipped hospital by a master of surgery.

A general appreciation of this fact will, in time, cause the would-be radiotherapist to expend adequate pains in acquiring an efficient technique, and the general practitioner to be more discriminating as regards the men to whom he entrusts his patients for the application of this force. Until such appreciation has obtained, however, a very large portion of sorry results must of course be expected to follow radiotherapeutic procedures, but let us at least place the blame unflinchingly where it belongs and not allow an increase in the already large and unmerited burden which has been heaped upon this unspeakably beneficent therapeutic agent.

# CURRENT PHYSIOLOGICAL THERAPY

## THE JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., December, 1905

1. Clinical and Experimental Study of the Action of Mercuric Cataphoresis in the Treatment of Cancer — Amedee Granger.
2. The present Status of the Treatment of Malignant Tumors — Wm. Edgar Deeks.
3. The Treatment of Pulmonary Tuberculosis by Means of Electrical Currents of High Potential and Frequency — John H. Burch.
4. Physical Methods That I Have Used in the Treatment of Pulmonary Tuberculosis — Francis B. Bishop.

1. See THE ARCHIVES for December, 1905, page 341.

2. See THE ARCHIVES for January, 1906, page 58.

3. See THE ARCHIVES for December, 1905, page 350.

4. The ability to benefit patients suffering from pulmonary tuberculosis consists very largely in ability to effect the nutrition of the lung substance through influence upon the nerve centers and nerves that control the circulation and metabolism of the lungs. A tubercular deposit acts as a foreign body which it is the effort of the organism to get rid of; it also acts as a focus of irritation whereby the metabolism and function of the respiratory apparatus is disturbed. Bishop believes that "If we can relieve the chest walls even temporarily, of the atmospheric pressure, increase the lung capacity, stimulate deep and regular breathing, open the nostrils, and give the patient atmospheric air thoroughly mixed with ozone, stimulate the nerves and nerve centers that control the blood and nerve supply, increase anabolism, diminish catabolism and thereby equalize metabolism and establish nutrition to the diseased structures, we will be able to cure a large percentage of our cases."

Altitude, gentle exercise and diet are

very efficient in this connection, but many people are financially unable to secure them, and Bishop believes that all these conditions may be attained in a very efficient degree by the use of physical therapeutics. First he removes all nasal obstructions to free breathing by local treatment, then loosens the clothing around the waist and chest after which the patient is positively insulated in a semi-reclining position, and the large static cage lowered over the head and shoulders (or with weak patients the whole body), and connected with the negative side of the static machine. The inside of the cage is furnished with brushes of tinsel, and Bishop believes that the ozone generated by the convec-tive discharge therefrom exercises an im-portant influence upon tuberculosis by in-creasing respiratory capacity. The im-mEDIATE effect upon the patient is exhi-lating and invigorating to such a degree that he shows himself eager for more treatment. Bacilli frequently disappear from the sputum.

Bishop also stimulates the pneumo-gastric and phrenic nerves by placing the positive electrode over the nucha, negative sponge electrode over the dia-phragm on the margin of the ribs in front and on the side corresponding to the diseased lung, and passing about 10 ma. of the interrupted current for three minutes. After this the spinal nerves and sympathetic ganglia between each of the spinous processes are stimulated by mechanical vibration for a half minute, from the superior cervical region to the fifth lumbar vertebra.

He also recommends keeping the pa-tients out of doors when possible, that they sleep with windows open summer and winter, wear warm, light clothing, take all the outdoor exercise that they can short of fatigue, drink plenty of pure water, and eat nourishing food. They are also carefully instructed in the art of deep and regular breathing, which

of itself is a good respiratory stimulant, and also stimulates the liver, heart, intestines, kidney, and spleen.

Two cases are reported in one of which the result was gratifying. This patient was a girl 28 years old with tuberculous family history, who was in the early stage of the infection. She had fever and night sweats, an area of dullness in the right apex, moist râles, cogwheel respiration, bacilli in the sputum, and had lost flesh. She was treated half an hour every day for three months; all physical signs and bacilli in the sputum disappeared, and she gained 10 pounds in weight. The improvement in this case had continued up to a few years ago when the author lost sight of her.

#### AMERICAN JOURNAL OF PROGRESSIVE THERAPEUTICS

Chicago, Ill. October, 1905

1. The Principles of Photography for X-ray Workers — V. J. Willey.
2. On the Importance of Differentiation in the Use of Electric Modalities — A. D. Rockwell.
3. The Cure of Carcinoma by Means of the X-ray — Heinz Wohlgemuth.

1. This author calls attention to the necessity of a skiagrapher doing his own developing if he expects to get good results, and points out the marked difference between what is called a good photograph, and what would be regarded as a good negative by a radiographer. He maintains that no essential difference exists in the results sought by the photomicrographic process and the skiagraphic, as the operators in both cases are interested in getting a sharp, clear, and contrasting negative.

Attention is called to the facts that short exposures give greater contrast while long exposures give flatness, and that no one tube can be depended upon to produce all effects; it must be selected according to its fitness for the individual case.

Willey has devised an ingenious penetrometer composed of sections of an aluminum rod cut off at different lengths and set into a suitable support of lead and brass, and has adopted arbitrary rules based upon experience to determine the proper tube to use in a given case. Tubes whose rays will penetrate from eight to twelve millimeters of aluminum are called "soft," and those whose rays will pass through from ten to sixteen millimeters of aluminum are called "medium." He also points out the liability of error through under-exposing a high tube which may thereby be taken for a medium one. He employs as soft a tube as can be used for the work in hand, and depends upon his meter to determine the proper tube to use in a given case, when located at the same distance from the anode as the plate. He also recommends the use of a fluoroscope in selecting a tube for skiagraphic purposes.

Amateur radiographers are cautioned against trying different developing agents; they should select one and expose for that one until they become experts and are able to manipulate the developer to suit their own needs. Plates should be developed before the patient is allowed to go, in order that an exposure, if poor, may be corrected. Attention is called to the well-known fact that over- or under-exposure, if known, may be helped by modifying the developer to suit the conditions. An exceedingly good developing formula that has been in use in some of the largest laboratories in the United States and which, if carefully made from fresh chemicals, gives ideal results, is recorded as follows:

Water . . . . .	.
Acetone sulphite-Bayer . . . . .	.
Sodium sulphite (c.p. desiccated) . . . . .	.
Edinol . . . . .	.
Hydroquinone . . . . .	.
Potassium carbonate (c.p. desiccated) . . . . .	.
Potassium bromide . . . . .	.
300 c.c. (10 oz.)	.

10 grams. (150 grains)  
 30 grams. (1 oz.)  
 4 grams. (60 grains)  
 2 grams. (30 grains)  
 60 grams. (2 oz.)  
 1½ grams. (20 grains)

Dilute each part with from four to six of pure water before using. The used developer may be preserved in well-stoppered bottles and used for the development of plates exposed through thin parts of the body. Some of the old developer, which is still clear, may be added to the new if increased clearness and contrast are desired. More hydroquinone and less edinol gives greater contrast.

The whole article is one of the most intelligent and thoughtful works upon this subject that has ever appeared in print.

2. See THE ARCHIVES for December, 1905, page 314.

3. See THE ARCHIVES for December, 1905, page 325.

#### ARCHIVES OF THE ROENTGEN RAY

London, England, December, 1905

1. A Case of Myotonia Congenita Treated by Voltaic Alternations, Massage, and Suggestion — Gustav Reus.
2. The Exploration of the Thorax by Orthodiagraphy (Continued) — H. Guilleminot.
3. The Cooper-Hewitt Mercury Vapor Lamp and Valve — Maurice Leblanc.
4. Notes on X-light — William Rollins.

1. Reus' patient was a lady aged 24, married, with a negative family history. Her childhood was uneventful and healthy, but a clumsiness of the legs was noticed from childhood, she walked like a doll, and suffered frequent falls. This stiffness passed off after a few minutes exercise. It was confined largely to the lower extremities, and was more marked during the menstrual epoch.

Examination of vision, reflexes, response to electrical stimulation, etc., con-

firmed the diagnosis. Before rising in the morning the patient was given a massage of the lower extremities, followed by a course of exercises in bed; this simply rendered the legs more supple. Treatment by suggestion was unsuccessful and abandoned. Treatment by interrupted alternating currents 40 per second, with one electrode applied over the spine and the other to the feet by a water bath, each session lasting 10 minutes, twice daily, was employed together with vibratory massage of the limbs and along the spine. In four months' treatment the patient was considerably improved.

2. Potain estimates the area of the heart outline, as shown by percussion, at 90 square cm., but by means of the orthodiograph this area is shown by Moritz to be nearly 100 square cm. Other observers have found this area to run from 60 to 104 square cm., but such measures are not of any great value.

A heart should be as large as necessary and no larger. Attempts have been made to fix a ratio between the heart area and the height, the heart area and the cross section of the thorax, the heart area and the total weight, and the ratio of this area to the weight of fixed albumen. Since these measurements run from 89 to 125 square cm. it would seem that there was something wrong, and it is evident that the different observers are not employing identical methods or else the measurements depend too much upon the personal equation.

Bouchard has observed the heart to be constantly smaller in tuberculous patients. He believes if a tubercular patient has a normal heart, he only becomes infected because he is repeatedly and directly exposed, whereas he considers a small heart a predisposing cause of tuberculosis. This smallness in the cardiac area is only found in tuberculous subjects; many pathological states cause an increase of the heart area, but

few a decrease. The writer measured the cardiac area in three tuberculous patients who are considered cured. In all the cases the cardiac area is above the normal. He believes from this, that only those cases of tuberculosis recover which in the first stages possess a heart whose area is normal.

3. Leblanc goes very thoroughly into particulars underlying the operation of the mercury vapor lamp. The gas in a tube at low pressure behaves as a perfect dielectric up to certain voltages, depending upon the nature of the gas and its pressure, when the maximum is exceeded the gas behaves instead as a conductor for the current.

Mr. Cooper-Hewitt found that this phenomenon depended upon what he termed the "repugnance" of the cathode, and that the main resistance of the vacuum tube, manifested at the surface of the cathode is out of all proportion to the resistance offered by the length of the column of air in the tube, and that this resistance is lost when the surface of the cathode is disintegrated by the passage of the current. Hence if a vacuum tube is primed by passing a strong current, a few volts will suffice to continue the passage of a current of large volume; thus a pressure of eight volts sent a current of 100 amperes through a tube 20 cm. in diameter, the resistance of the tube being diminished by this priming to about 12 ohms.

The tube moreover rectifies the current, even when of high frequency, very efficiently since the surface of the mercury shows but little resistance when it acts as anode, but the resistance is very high when the mercury acts as cathode, unless its surface is kept continually disintegrated. Other substances such as graphite and postassium act similarly, but the surface is not spontaneously reformed as is the case when mercury is employed. Thus a vacuum tube is constructed which offers a slight resistance to a constant current if the cathode be

of mercury, the tube primed by a powerful current which disintegrates the surface of the cathode, and the current afterward employed is sufficiently intense to keep the mercury continually disintegrating. The anode is usually made of iron, since if it be also mercury the metal will distil and the current must be stopped from time to time.

The priming of the tube or the breaking down of the resistance offered by the gas, is the important point and may be accomplished by subjecting the tube to a high voltage for a moment. The output of energy required is large but need act but a short time. Such an output is obtained by the use of a self-induction coil in series with the anode. A resistance and rapidly-acting interrupter are shunted across the tube. The end of the tube containing the cathode is surrounded by a layer of tinfoil connected with the anode. This tinfoil with the glass of the tube and the mercury within the tube forms a small condenser placed in parallel with the interrupter. When the interrupter is open, the extra current charges the condenser. This causes an alteration of surface tension in the mercury cathode. The surface is agitated and disintegrated at the same moment that the dielectric cohesion of the gas in the tube is being destroyed by the current from the self-induction coil. The tube is thus primed, becomes a conductor and the current continues to pass through it. The voltage required to prime the tube is proportional to the length of the tube, but must be increased as the tube rises in vacuum.

In order to avoid excessive rise of vacuum necessitating excessively high voltage for priming, tubes are constructed having two anodes and one cathode, the second anode being situated as closely as possible to the cathode. The tube is primed through the near anode, and when the current passes, the remote anode is thrown into service, but if the tube is cold its resistance may be so high

## CURRENT PHYSIOLOGICAL THERAPY

that it is impossible to prime it in this manner. It is then simply inclined until a thin thread of mercury connects the anode and cathode short-circuiting the tube; it is then suddenly jerked into an upright position and the spark from the surface of the mercury resulting primes the tube.

The voltage necessary to send a current through a tube with a mercury cathode that has been primed, decreases as the tube vacuum increases. Under these circumstances the mercury vapor penetrates the whole length of the tube which becomes luminous with a bright green color. This light falsifies natural color and renders the complexion corpse-like, but it is very restful to the eyes, very economical, requiring only .43 watt per candle-power. Covering the tube with silk impregnated with rhodamine cuts off 25% of the light, but adds red rays which make the complexion appear normal. The light from the unshielded tube has a peculiar calming effect, and is suitable for photographic work.

A tube has been made of quartz which permits the passage of the ultra-violet rays; such a lamp is dangerous to look at being exceedingly rich in these rays, but of great value for the treatment of lupus, etc.

4. Rollins describes some derma-ray tubes devised for the purpose of getting a source of radiation as close to the seat of the disease as possible. They do not differ from the well-known type. He also suggests the employment of an aluminum dish instead of a glass ball for compressing the abdomen in radiographing the kidney, the aluminum acting as a selective filter.

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ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, November 25, 1905

1. Action of the X-ray on Bony Tissue — Dr. Recamier.
2. Exact Measurements in Radiology — Dr. Curchod.

3. Differential Diagnosis of Various Forms of Progressive Muscular Atrophy — Dr. V. Capriati.
4. The "Antonome" Interrupter after Four Hundred Hours' Operation — Dr. G. Haret.
  1. See THE ARCHIVES, page 83.
  2. See THE ARCHIVES, page 83.
  3. In two cases of progressive amyotrophy the writer has found a diminution of faradic and galvanic excitability. When the intensity of the current was increased to 10 or 12 ma., he obtained contractions at the closing of the positive and the negative poles. But, at the same time contractions appeared when the current was broken and the latter contractions increased rapidly so as to become soon greater than the closing contractions. Such a phenomenon happens only when the muscular tissue being atrophied, the intramuscular nerves become more superficial, and at the same time retain their normal condition. Capriati therefore considers it as being pathognomonic of essential amyotrophies without participation of the nervous system.

4. Dr. Haret has used Gaiffe's interrupter during five months with an average of three hours' work a day. During these five months, Dr. Haret was obliged once to reestablish the level of the alcohol, and once to cleanse by filtration the mercury of which none was lost during the operation. That is all the attention required by this mechanical interrupter, the regularity of which was perfect, and Dr. Haret thinks it an interesting fact to state, now that electrolytic interrupters seem to have the exclusive favor of the medical public.

Dr. Carlos Santos of Lisbonne, Spain, describes a new model of localizing cylinder for radioscopy, radiography, and radiotherapy which he has used for more than a year. It consists of a vertical support placed on a heavy base. On the vertical support slides a horizontal wooden arm which can be fastened with

a screw in all possible positions. At the end of the horizontal arm is placed a brass disc with circular apertures to each of which is adjusted a cylinder. The length of these cylinders can be modified by telescoping the segments which constitute them. The length may thus vary from five to thirteen cm. and the three principal diameters used by the author are 11, 7, and 3 cm.

This localizer costs practically nothing, can be placed in all positions, and answers every purpose of X-ray diagnosis and therapy.

#### JOURNAL DE PHYSIOTHERAPIE

Paris, France, November 18, 1905

1. Gymnastics for Abnormalities — Dr. Courjon.
2. Education of the Respiratory Functions — Faure, Reymond, and Racine.
3. Psychic Re-education and the Treatment of Neuroses — Dr. Paul Emile Levy.
4. Influence of X-rays on Developing Bony Tissue — Dr. Recamier.
5. Exact Measurement in Radiology — Dr. Curchod.

1. Motor education, still more important in abnormal than in normal children, must begin with purely passive movements and gradually proceed with movements requiring an increasing voluntary participation. First the lower limbs must be educated. When the child is able to walk we must begin the education of the upper extremities. After passive movements, flexion and extension of the different joints, teach the child how to grasp an object. A great number of abnormal children are unable to place the thumb in opposition. Special instruction on this point is given with wooden cylinders first, and later with objects of diversified shapes. Hanging by the hands from the different ladders used for gymnastic purposes is beneficial. Education of touch comes next, and is combined with simple exercises for the special training of the hand. The use of sight is educated with differently-colored pieces of wood.

All this must be combined with a progressively parallel intellectual education. Teaching how to breathe regularly and deeply through the nose comes next; singing is a good adjuvant. Lastly gymnastics, in the ordinary sense of the word but without the movements requiring more than ordinary skill or strength, achieves the education.

2. Methodical respiratory education is easy because all the respiratory muscles are subject to the control of the will. The indications are found in the general conditions (anemia, weakness, convalescence, neurasthenia, sluggish nutrition), or in the local elements (chronic bronchitis, emphysema, suspicions of tuberculosis, thoracic insufficiency).

In 81 children from four to twenty years of age, of which some were almost normal, some had scoliosis, some others were convalescing, some others were under suspicion of tuberculosis, the respiratory amplitude increased 1/5 to 1/2. The convalescents improved most. The normal subjects improved least of all. In 26 adults presenting respiratory insufficiency, the respiratory amplitude increased 1/3.

Respiratory education modifies deeply the inner chemical functions. It causes a real oxygen sur-alimentation, and is invaluable as a preventive against tuberculosis. Where the latter has set in, respiratory education cannot take the place of the air cure but is a useful auxiliary to the latter.

3. Dr. Levy's lengthy article is the reproduction of several conferences he gave in Paris, in which he established the existence of psychotherapy as a special branch of therapeutics, and tried to delimit its domain. Psychotherapy and rational reeducation are synonymous terms. Psychotherapy must not confine itself to a haughty contempt of other therapeutics, but must know how to use those other measures as adjuvants to the principal treatment.

4. A cat, four days old, was submitted in two weeks six times to X-ray influence for 10 minutes and showed, a month after the late exposure, a marked atrophy of the skeleton of the exposed side. The author announces his intention of making complementary experiments.

5. The question of measurements has not progressed as fast as the other branches of radiology. But we know enough to control the production of radiodermatitis or any other untoward effect. Until recently Bedlere's spintermeter and Benoist's radiochromometer were the only appliances used, but they do not give any information as to the quantity of X-rays. Now Kienbock has established that the effect of X-rays is directly proportional to the quantity of X-rays absorbed by the skin. Holzknecht's radiochromometer was a marked improvement. Labouraud and Noire's radiochromometer is in several respects more practical than Holzknecht's. Gaiffe's special milliammeter enables us to keep a tube in the same working condition for a long time.

Due consideration must be given to the number of interruptions of the primary current. Most interrupters have an annexed tachometer. The writer praises most decidedly electrolytic interrupters, and states that a very satisfactory interrupter can be made at very little expense in the following way: Take an ordinary glass jar, six to ten liters in capacity, fill it with a 1/30 solution of magnesium sulphate, the interior having been previously lined with lead foil which acts as a negative electrode. The positive electrode is formed by platinum wires soldered at the end of four glass tubes. The diameter of the wires varies from five to seven-tenths of a millimeter, the length between five and fifteen millimeters. The external extremity of the wire is dipped in the magnesium sulphate solution while the

inner extremity is connected with the positive pole of the source of electricity through a certain quantity of mercury in which is dipped the conductor wire of said positive pole.

The hour glass tubes are simply attached to the cover of the glass jar. By taking separately each one of the circuits formed by an interrupter and a wire, and then by combining together the various circuits, the intensity may be changed from two to eighteen amperes. This appliance costs about \$5.00 and it wears out much more slowly than a \$70.00 Wehnelt. This interrupter has been devised by Dr. Marie (of Toulouse). Curchod has still further simplified it by uniting eight interrupter tubes in one single circuit instead of four distinct circuits, and by using a rheostat to modify the intensity of the primary current.

It is possible for every operator to determine once and forever a certain number of constant factors, always the same for a given installation, and then measurements take a mathematical precision. It is to be hoped that radiologic measurements will become more and more simple, and at the same time more and more accurate.

#### BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.

Paris, France, September and October, 1905

1. Influence of the X-ray upon the Ovary — Dr. A. Laquerriere.
2. Electrical Treatment of Constipation and Entero-Colitis — Drs. Laquerriere and Delherm.
3. Treatment of Epithelioma by the X-ray and High Frequency Currents — Drs. Delham and Laquerriere.

1. Dr. Laquerriere has treated by radiotherapy a woman 50 years old, who has been treated for several years for a uterine fibroid by various electrical methods, and had of late developed an absolute intolerance to electrical applications every one of which gave rise to

an attack of major hysteria.

Direct X-ray treatment was given during five or seven minutes over each ovarian region through a Beclere iris-diaphragm with a tube four inches distant from the skin and with an equivalent spark of 2-3 inches. The galvanometer of Gaiffe's new apparatus was maintained at 0.5 ma. Treatment once a week. Eight treatments produced considerable improvement. The hemorrhages which had been the most troublesome symptoms, and which of late had become continuous, stopped almost entirely after the sixth treatment.

All cases are not as favorable. The action of the X-ray on fibroids probably finds its explanation in the action of the X-rays on the ovaries. May we not think that we shall find with this indirect treatment the same irregularities that were noted when fibroids were treated by another indirect treatment, namely, the extirpation of the ovaries? Radiotherapy therefore must not be relied on too much in the treatment of these tumors. The case published by Dr. Laquerriere is not even very conclusive, because the patient had reached an age when spontaneous regression of fibroids is by no means uncommon.

2. Electrical treatment of constipation must not be a last resource called in when every other rational and irrational treatment has failed. When systematic treatment, properly directed, has failed to give relief after three months, electricity should be resorted to. Spasmodic forms require mild treatments, atonic forms vigorous methods. Whatever may be the method, applications must be graded. Repeated and untimely contractions of the abdominal muscles are to be avoided. Sudden reversals of the current may be useful in certain patients, but in others they are harmful because they increase the intestinal spasm.

When constipation is symptomatic, the cause must be treated first. In "essential" constipation the only absolute

contra-indication is found in neuropathic patients who are afflicted with "visceral insanity," and present subacute symptoms absolutely out of proportion to the severity of their affection.

Relative contra-indications are found in patients who argue constantly with their physician and try all sorts of incoherent therapeutics together with the electric treatment; and in those who live in a perpetual phobia of intestinal fullness. A slight appendicalgia is not a contra-indication, but it is a warning to use caution.

A general medication is necessary in many cases, to modify the nervous condition of the patient. Anal spasm, if existent and undetected, may be a cause of failure. High frequency currents are here very useful.

Failures are often explained by an undetected cancer, or tubercular enteritis. Constipation of medullary origin can be improved sometimes but cannot be cured.

Whether it is advisable to stop all laxative medication as soon as the electrical treatment is started is still a moot point. Some prefer radicalism, but progressive diminution carried on as quickly as possible seems wiser in many cases.

3. In three cases the writers have obtained quicker results by combining the direct high-frequency spark from a metal point with the X-ray. They will continue the study of the subject and make further reports. The most powerful apparatus is the best, the quantity of the current being the most important factor.

#### FORTSCHRITTE AUF DEM GEBIETE DER ROENTGENSTRÄHLEN

Berlin, Germany, Band IX, Heft 2

1. Concerning Regressive Bone Changes in Acromegalia — Dr. Hans Curschmann.
2. A Simple Modification of the Compression Diaphragm — Dr. G. Holzknecht and R. Kienböck.

3. A Röntgen Drum Diaphragm — Dr. George Schellenberg.
4. Concerning the Treatment of Skin-Carcinoma with the Röntgen Rays — Dr. Loser.
5. Acute Osteo-myelitis in the Röntgenogram — Dr. Carl Ritter.
6. Supplement to the Studies Concerning Osteomalacia by Dr. Lauper in Vol. V of this Journal — Dr. A. Schirmer.
7. Concerning the Treatment of Leukemia with the Röntgen Rays — Dr. Max Cramer.

1. Curschmann notes by a radiographic investigation of the osseous system, an excavation of the sella turcica, the lower jaw projects so that the lower incisor teeth extend considerably beyond those of the upper jaw. The spinous processes of the cervical vertebrae appear to be elongated and thickened, though the bodies show no change. There is no noticeable change in the bones of the hand. In the wrist the carpal bones are crowded toward the radical side. The distal epiphyses of the radius and ulna are thickened and very irregular. There is also a rarefaction of the outer portion of the lower extremity of the radius. The tibia and fibula are practically normal. The diaphyses of the phalanges of the first, second, and fifth toes are abnormally thin at the distal ends, but there is distinct thickening of the epiphyses. The case was studied twelve years after the first symptom and six years after the first cerebral symptom had developed. The author reports four cases. The first three showed atrophy and rarefaction of the lower epiphyses, while the fourth which had existed ten years showed no such change.

2. Holzknecht and Kienböck make the observation that the Albers-Schönberg compression diaphragm is both complicated and costly. They have, therefore, designed a simple modification consisting of a cylinder which, by means of a series of swivel joints, is made to rotate in any direction, and

slides up and down a vertical post attached to a base large enough to hold a plate.

3. Schellenberg encloses his tube in a box which contains an opening the size of which is controlled by diaphragms. This box hangs from wires passing through a pulley which makes it possible for it to be raised and lowered. It can also be moved from the head to the foot of the table.

4. Loser reports his results in the treatment of 20 cases of carcinoma of the skin. He has cured three, and these have remained free from recurrence one and one-half years to date. Five cases showed improvement, though four of these were treated over a year. Eight cases quit the treatment too soon to be able to draw any conclusions. In two cases he got improvement on the surface with extension of the malignant cells underneath. In two cases in which no improvement was noted there was relief of pain but this effect was not permanent. The author is not enthusiastic over the healing power of the rays.

5. Ritter has studied three cases of acute osteo-myelitis very carefully, in the various stages of the process and shows the periosteal protuberance very early in the process. He then traces this process to the stage of the formation of a sequestrum. The most interesting point is the ability to show the early involvement of the periosteum, and thus confirm an early diagnosis.

6. The case forming the basis of this paper was first reported by Dr. Lauper in this Journal in 1902. The patient died July 22, 1904. The chief points of interest are the beginning of the disease in the seventeenth year; in the nineteenth year an osteotomy enabled the physician to study the disease in its acute form; in the twenty-fifth year an oophorectomy was performed; the following year all symptoms of pain and tenderness disappeared; in the thirty-second year incipient tuberculosis

developed, followed by a tubercular perforation of the bowel from which the patient died. The bones were ankylosed from the second lumbar vertebra down, and were so soft that they could be impressed with the finger.

7. Cramer reports six cases of leukemia treated with the Roentgen rays. In four of the cases there was distinct improvement, while in two there was no noticeable result. The first two cases were typically myeloid leukemia, and were apparently cured after 300 and 450 minutes of exposures respectively. There was first improvement in the general condition, then of the blood, followed by a decrease in the size of the spleen.

A study of the literature shows that the cases having bone pains or enlargement of the glands require more raying than the other cases. Krause showed that cases of the first type required from 2,355 to 3,650 minutes as against from 210 to 840 minutes in the other cases. No destruction of the erythrocytes was noted.

Two of the cases were of the lymphatic type. There was marked improvement in the general health, and a reduction in the leukocytes from 151,-

000 to 34,800 after 700 minutes' exposure, and in the other case a reduction from 644,000 to 20,000 after 500 minutes' exposure. There was no change in the size of the glands. In fact at times they seemed to grow larger. In general the treatment of lymphatic leukemia is less satisfactory than the treatment of myeloid leukemia.

A quantitative analysis of the urine in four cases was made many times. In general the results were negative.

The author concludes that the shorter the duration the more easily is the disease influenced. The myeloid type can be restored to a normal condition. The lymphatic type or those with enlargement of the lymphatic glands and bone-pains require more treatment than the others. In old cases reduction in the size of the spleen is not to be expected. None of the cases can be promised a cure, but their lives can be prolonged a number of years.

The treatment should be given with medium hard tubes. The treatment should be given in periods, and the blood should be carefully studied in the intervals so that treatment can be instituted again as soon as there is an increase in the leukocytes.

## ELECTROTHERAPY

### CATAPHORESIS IN MALIGNANT GROWTHS

F. O. Marsh, *The Medical Brief*, January, 1905

This article treats of the management of malignant disease by the introduction of ions of zinc and mercury into the growth by the use of heavy electric currents, as evolved by Dr. G. B. Massey of Philadelphia. He calls attention particularly to the fact that this method should not be confounded with the Apostolli method of treating fibroid tumors of the uterus, as in the latter it is only

the current (electrolysis) which is effective, whereas in the Massey method it is the chemical effects of introducing zinc and mercury ions into the growth that is to be relied upon. The method of applying this treatment is as follows:

"The one hundred and ten-volt direct Edison current, or a current of similar strength from a sufficient number (about sixty) battery cells is employed. An efficient controller must be inserted in the circuit, best of the graphite type for turning the current on and off very gradually, without shock to the patient.

"A milliamperemeter capable of registering a thousand or fifteen hundred milliamperes should be in the same circuit with the patient for keeping track of the current strength employed. The patient having been thoroughly anesthetized, is laid with his back upon a broad clay pad, which should be large enough to cover the whole back and even extend down under the buttocks and under surface of the thighs. The clay electrode, soaked in warm water to increase conductivity, is in immediate and intimate contact with the skin, the lower surface being also in contact with the negative plate of sheet lead.

"The positive pole is connected by a leash with three or four amalgamated zinc points, which are thrust into the substance of the growth to be destroyed.

"The current is then turned on very gradually till the milliamperemeter indicates a current of one hundred and fifty to two hundred and fifty milliamperes to each point, the total current rising to a strength of seven hundred or eight hundred milliamperes or more. Of course, care and circumspection must be used in the neighborhood of important nerve trunks, the phrenic, pneumogastric, etc.

"By the cataphoric diffusion of the zinc and mercury salts the growth is gradually devitalized and converted into an odorless eschar, which subsequently separates."

Among the marked advantages exhibited by this method are that it is a bloodless operation, there is no creation of fresh surfaces thirsting for infection, there is no pain after the operation, and no odor in the eschars.

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#### THE THERAPEUTIC VALUE OF STATIC ELECTRICITY

May Cushman Rice, *Medical Record*, December 16, 1905

There are so many modes of application of static manifestations varying from the most mild, as in the breeze, to the exceedingly severe, the heavy spark

for example, with corresponding sedative or stimulating effects, that it is possible to adapt them to a great variety of cases. The positive breeze is especially valuable for relieving congestion. In sprains and contusions its early application is a most valuable adjunct to other treatment. Congestive headaches, which have resisted all other remedies yield to a positive breeze; even the headaches of the menopause, which are generally most difficult to cure, respond to a course of treatment with the positive pole. If, on the other hand, the negative pole be used, the headache is increased in severity. Contrary to theory in general and the opinion of some electrotherapists, experience has convinced the author that results depend largely upon the selection of the proper pole.

What class of cases is more puzzling to the general practitioner than the functional neuroses, neurasthenia, hysteria, and epilepsy? Whatever the causative factor, there is always present nerve irritation with faulty metabolism and resulting auto-intoxication. How often, after all else has failed, is the patient advised to try electricity more as a means of getting rid of a hopeless task than with any real expectation that electricity will be of any benefit.

The electrotherapist, on the other hand, administers with confidence the positive static breeze, knowing its power to allay nerve irritability, to bring about nutritive changes through its action upon cell protoplasm, to increase secretion and excretion, and improve elimination and thus prevent that auto-intoxication which is responsible for the most distressing symptoms of neurasthenia, namely, fatigue, headache, and insomnia.

The static spark is the opposite of the static breeze. In the latter we have a marked sedative, in the former a pronounced stimulant. Sparks produce counter-irritation and muscular contractions, and are powerful stimulants to the tissues. They are useful in breaking

up adhesions, and in hastening the absorption of deposits. While they are particularly adapted to chronic rheumatism, they will abort acute rheumatism, provided patients are anxious enough to be cured to endure heroic treatment.

Short, thick sparks, applied in rapid succession to ganglions so often appearing upon the back of the hand, will cause the wall of the sac, unless very thick, to rupture. Instantaneous evacuation of the cyst takes place and there is a rapid absorption. The walls of the sac adhere and a cure results.

While it is not possible to localize static electricity, the entire body always receiving somewhat of a general charge, the breeze and the spark are generally applied for the relief of some particular part of the body. A sprained ankle receives a breeze from the point electrode. A head-breeze is given for the relief of a headache. Sparks are given to stimulate the circulation of a part. Although at the same time there is a general charge, the treatment is given chiefly for its local effect. This is not the case with static insulation or electrification, as it is sometimes called. The latter is given not for its local but for its general effect. This form of current in particular is well termed an equalizer, because with this application there is a stronger tendency to restore lost equilibrium than is the case with any other form of administration of static electricity.

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#### THE TREATMENT OF CHANCREOIDAL, HERPETIC AND VARICOSE ULCERATIONS BY THE HIGH-FREQUENCY SPARK

George M. MacKee, *Journal of Cutaneous Diseases*, December, 1905

The author claims to have applied the high-frequency spark to 12 cases of this character and with uniformly good results. The Piffard hyperstatic transformer actuated by a ten-plate static machine was used.

*Case I.* M. H., 22 years of age. On October 26, 1903, three days after

sexual intercourse, he developed a group of herpetiform vesicles, situated in the sulcus one-half inch from the frenum, which soon ulcerated and uniting, developed a discharging ulcer about one-half inch in diameter, involving the frenum and glans. Several small ulcers developed on the glans and the mucous surface of the prepuce.

On December 23, after a thorough cleansing with distilled water, the lesions were sparked for five minutes every second day with the hyperstatic current from the positive terminal of the secondary coil, the negative terminal being grounded. A pointed carbon electrode was used. The immediate effect was an exudation of serum, the disappearance of the yellow tenacious discharge which had remained upon the floor of the ulcer even after cleansing, considerable increase of the induration, followed in 24 hours by a diminution of the inflammation, pain, discharge and induration. The small ulcers healed after the second treatment, the induration of the large one had disappeared, and its base was covered with healthy granulations. At the time of the fifth treatment the granulations were slightly elevated above the surrounding mucous surface, and the epithelium had advanced from the margins, leaving an uncovered surface of about one-fourth inch diameter. After the fifth treatment there was a considerable overgrowth of granulation tissue, which was reduced by applications of silver nitrate.

On January 10th, 17 days after the first application of the high-frequency spark, and as a result of five such treatments, the ulcer was entirely healed.

The treatment as given above was quite painful, but this objection can be overcome by not grounding the negative terminal, by using vacuum electrodes and by regulating the static spark-gap.

*Case II.* This patient presented a discharging ulcer one-half inch in diameter, on the dorsum of penis in the sulcus, and covered by a rather long foreskin.

The base and margin was considerably indurated, the induration being very hard and involving the prepuce and glans. A moderate degree of inguinal adenitis was present, the picture suggesting mixed infection.

On February 6th he began using the hyperstatic spark for five minutes every second day, using a silvered glass electrode filled with carbon, and not grounding the negative pole. Improvement began immediately and was continuous. On February 17th, the small ulcer had healed, and daily treatments were given the large one, until February 25th, when the granulations, as in the preceding case, became exuberant and were reduced by silver nitrate, and the sparkings discontinued. On March 1, after 13 hyperstatic treatments, covering a period of about three weeks, the ulcer was completely healed.

*Case III.* M. M., with a small round ulcer on the glans penis, which soon enlarged to the size of a ten-cent piece, with a sloughing base and undermined edges.

This ulcer persisted in spite of careful and thorough treatment until March 1, at which time hyperstatic treatments were begun and given every second day. Six treatments had been given and the ulcer nearly healed when the patient contracted diphtheria, the Klebs-Loeffler bacilli being demonstrated by Dr. L. B. Goldhorn. In three weeks the treatments were recommenced, the ulcer being in about the same condition as at first; complete healing resulted after five treatments.

*Case IV.* M. K., with a large ulcer at the end of a very long foreskin. Anti-syphilitic treatment failing, hyperstatic treatments were begun on September 17 and the ulcer was entirely healed by October 10, after 14 applications.

*Case V.* M. C., a salesman, 35 years old, and with a history of repeated attacks of gonorrhoea. On October 12,

1904, one week before his first visit and four days after coitus, he developed a small ulcer about one-eighth of an inch in diameter on the left lip of the meatus. The hyperstatic treatment was first applied on October 19, and continued for five minutes every second day for ten days, when he was discharged recovered. On January 22, 1905, he returned, presenting a very small meatus, resulting from cicatricial contraction, which was corrected by a meatotomy.

The remaining chancroidal cases, with but one exception, are so similar to the above histories, as to make them unworthy of record. The one exception was where two ulcers developed on the same individual at about the same time, one about the size of a twenty-five-cent piece and the other very much smaller. The large ulcer healed after six treatments, while the small one persisted for two weeks longer.

One curious effect of this treatment in most of the chancroids, was the formation of exuberant granulations, which condition was easily corrected by the applications of silver nitrate.

The author relates also several cases of varicose ulceration in which he claims good results.

It seems to him that in the high-frequency spark we have a valuable addition to the treatment of chronic ulcerations. Most of the cases observed had been of long standing, and had been treated by the usual methods before having the high-frequency spark applied. It will be interesting to note the results of this treatment in acute ulcerations, and in preventing the development of varicose ulcers.

#### THE SINUSOIDAL CURRENT IN GYNECOLOGY

H. Paull, *Zeitschrift für Diat. u. Physik-Therapie*, November, 1905

The author describes a bath-tub of his own construction which enables the physician to send the current in all direc-

tions through the pelvis. He first tried this sinusoidal current in cases of menorrhagia of various origins. In most cases an improvement was noticed, in many of them even *restitutio in integrum*, as far as the hemorrhage was concerned.

Then he gradually began to treat with this current hemorrhages from myoma, coccygodynia, retroversia and retroflexia uteri, hemorrhoids, suppurating tumors of the adnexa, chronic inflammatory processes of the pelvis, almost always with good results.

*In retroflexia mobilis et fixata* the position of the uterus could not be changed, but in nearly all cases the disappearance or an essential relief from the pains in the back was observed.

In oöphoritis suppurativa an improvement of the subjective symptoms was noticed.

In several cases of retroversio it was possible to bring the uterus into its normal position. Coccygodynia without material changes in the pelvis was almost always cured in a very short time, also varix ani. Hemorrhages of myomata ceased in a short time. In most cases the improvement was noticed after the first, not later than the third bath.

Chronic para- and perimetritis showed very distinct improvement of the subjective symptoms, even after a short treatment.

Several cases of endometritis and metritis in which the usual methods including curettage proved ineffectual were entirely cured with the sinusoidal bath.

#### DEATH BY ELECTRICITY

Dr. S. Jellinek, *Wien. Med. Woch.*, Nos. 44 and 45.

The following are the author's conclusions:

Death by electricity is caused by commercial direct or alternating currents of different tensions; experience teaches that under some circumstances not only high tension, but also low tension, *e.g.*, 65 volts, may have lethal effect.

Death by electricity is in most cases introduced with instantaneous unconsciousness; there are, however, authentically observed accidents which show that consciousness existed at intervals up to the time of death.

Death by electricity is combined with a momentary relaxation or paralysis of all muscles; but there also occurred deaths by electricity in which the victims as they were not freed from the calamitous contact were seized with tonic spasms; others were able in the first seconds and minutes of the effect of the current to call aloud for help.

The death by electricity causes in many cases immediate cessation of respiration; in other cases the respiration is kept up not only during current-flow but also after opening of the circuit, and ceases only gradually.

Death by electricity causes in some of its victims instantaneous cessation of the heart action, while in others a gradual decrease of the heart's action is observed.

Death by electricity occurs instantaneously in some cases, trauma and death occur at the same time, while in others it takes minutes before all symptoms of life are extinguished.

The results of animal experiments in general coincide with the experiences in practice, all of which goes to show that the electric death has no distinct, uniform symptoms; the phenomena which announce approaching death are different in different cases.

This difference depends both on the current and individual conditions. The mechanism of death by electricity is by a double action of the electric current. The current when entering the organism exerts a powerful irritation or over-irritation, which is nearly related to the shock effect; the possibility of eliminating to a certain degree this component of the electric force seems to be proven by the observation of sleeping linemen who are less affected by a strong current,

and of persons who are under the influence of a general anesthetic.

Besides the psychical component there is the dynamic effect within the body. The cells and all complexes in the path of the current suffer changes part of which can be seen in pathologic-anatomical pictures. Experiments seem to prove that death by electricity which is the result of psychical and dynamic effects, is, on the one hand caused by material

changes, on the other hand by disturbances or inhibitions of important functions. As experiences in practice, the results of animal experiments, and histological investigations teach us, the dangerous symptoms caused by electric trauma are often of a transitory nature and liable to improvement.

For this reason the author deems it highly probable that death by electricity is in most cases only apparent death.

## RADIODIAGNOSIS

### THE ROENTGEN METHOD AS A GUIDE IN OPERATING FOR LITHIASIS OF THE URINARY TRACT.

Carl Beck, *Jour. A. M. A.*, December 23, 1905

Beck claims that with modern skiagraphic technique the presence or absence of renal calculi can be determined with practical certainty. The chemical composition of the calculi determines the density of their shadows, but this is of less importance than bringing the calculous area as near to the plate as possible, and keeping the field absolutely quiet. These two requirements are met by the use of a tubular diaphragm which also has the advantage of permitting the passage only of the focal rays, but also, the disadvantage of showing only a small area at a time. A general exposure, therefore, must precede that of a limited area.

An area must *a priori* be included on the plate which is bounded by the eleventh rib and the crest of the ilium on one side and by the vertebrae and the anterior axillary line on the other. The *modus operandi* is described as follows:

"The general exposure is preceded by a thorough evacuation of the bowels. The patient is placed in the dorsal position on a large plate covering both lum-

bar regions. For localization, a few wire letters are distributed over the plate, the R. (right side) and L. (left side) being placed directly underneath the outer surfaces of the lumbar regions so that they appear on the integumental margins of the skiagraph. The head and shoulders are elevated by a few pillows, while the chin touches the sternum. The knees, after being flexed, are well immobilized by sand-bags. The exposure should last from five to eight minutes, in proportion to the thickness of the abdominal tissues to be penetrated. The vacuum of the tube should be soft."

The criterion of a good plate is that the vertebrae, the eleventh and twelfth ribs and the outlines of the ileo-psoas muscles can be clearly defined. Failing this and showing a number of calculus-like shadows, a plate is absolutely misleading, and a new trial should be made and repeated until satisfactory. If the plate is good and shows the indications of calculi, the tubular diaphragm is applied in the same position as for the general exposure, but the shoulder of the exposed side is more elevated. The tubular diaphragm is best pressed obliquely under the rib arch so that its center corresponds with the landmarks on the large plate.

The time of exposure should be three

minutes in thin and five or six minutes in stout individuals. If the large plate is negative, Beck still makes a dia-phragmatic exposure, and if this shows the criteria distinctly he can assure his patient that he does not suffer from nephrolithiasis. It is not necessary, however, that the bones show textural details. Usually the longer the exposure lasts, the clearer will the bones show and the less marked will be the calculi.

The same applies even more to the technique of biliary skiagraphy, and the reason of so many failures in this, he says, is that the exposures are made with such high tubes as to irradiate away, so to speak, the calculi. The same general principles apply to skiagraphy of the urinary bladder, but the diaphragm is not so necessary. The patient should be in the recumbent position and the center of the tube should be directed to the upper margin of the symphysis. The coccyx should show well, but the sacrum gives no details. An oblique exposure should also be made as it may show whether the stone is free or encysted.

For showing the number and position of calculi the Roentgen method is far superior to the cystoscope and it is much more pleasant for the patient. Beck's experience has led him to think that skiagraphy of the renal regions is always necessary when vesical calculus is suspected, and since he has acted on this suggestion he has always found renal calculus whenever one existed in the bladder. This explains the common recurrence of vesical calculus after operation. Several interesting illustrative cases are reported.

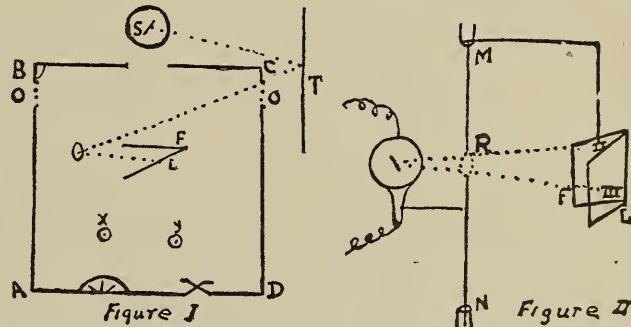
## A SCHEME FOR PROTECTION OF THE ROENTGEN RAY WORKER

C. M. Cooper, *American Medicine*, December 16, 1905.

"Figure 1 — A, B, C, D — represents a lead-lined wooden frame hinged at B. To the wall A D is attached the current plug and the rheostat. X and Y repre-

sent two handles which hang from above, by means of which two multiple spark gaps attached to the coil can be controlled. O and Q are two small windows of heavy lead glass. Through O the patient and the tube can be watched.

"Figure II represents a middle vertical section of the front B C. M N is a lead-lined board balanced by a system of weights and pulleys. It carries the tube by an outside arm and the fluoroscope by an inside arm, as shown in the figure. At R is a circle of six in. diameter, which can be diminished at will. The anode of the tube, the center of the circle, and the center of the fluoroscope can be adjusted to occupy the same straight line. They then, together, can be readily raised or lowered. This gives us a vertical orthodiagnostic effect. The lateral movement of the patient gives us a transverse orthodiagnostic effect. To the fluoroscope F is hinged a mirror L at an angle of  $45^{\circ}$ . The observer stands entirely outside of the primary ray beam



I-2-3, and watches the reflected shadows in the mirror. He is even then subjected to the secondary rays emitted by the patient's body, etc., but these are trivial compared to the primary beam. The view obtained is satisfactory and the pulsations of aneurisms and the movements of the diaphragm can be clearly seen. The leaden lining is metallically connected with the gas pipe, so as to conduct away the induced electric currents.

"A just criticism of such a scheme as this would be that it presupposes much knowledge as to the appearance of Roentgen-ray tubes of different vacuums when energized. This necessary

knowledge can be acquired in a way readily understood by referring to Figure I.

"T is a mirror so placed that the reflection from the tube S can be seen by looking through the window Q. Its penetrating power can at the same time be gauged by interposing various structures, *e. g.*, movable aluminum plates between the tube and the fluoroscope; by means of the spark gap the appearance of the tube and the ray penetration can be varied at will and mentally correlated."

### THE ROENTGEN RAYS IN DENTISTRY

Mihran K. Kassabian, *Jour. A. M. A.*, December 16, 1905

Kassabian describes the methods and clinical uses of skiagraphy in dental surgery. Two methods are commonly employed, the intra-oral and the extra-oral. In the former he uses a specially-pre-

pared, double-coated film, which is cut out to the size required and enclosed in a layer of black paper and a snugly fitting yellow envelope, the smooth side of the envelope corresponding to the sensitive side of the film. The envelope is pressed against the teeth and hard palate in such a way that the rays fall perpendicularly to the vertical axis of the teeth, the exposures varying from two to ten seconds. The extra-oral method requires a large plate, 8x10 inches, which is pressed against the affected side. The jaws are wedged apart, and to avoid shadows of the opposite side the rays are sent at an angle of 45° from a distance of 20 inches; exposure varies from one to three minutes. By these methods, the anatomy and evolution of the teeth can be studied, unerupted teeth discovered, ankylosis of the jaws, true or false, examined, dead pulp and inflammatory conditions ascertained and limited, and abscess of the antrum and sinuses detected.

### RADIOTHERAPY

#### ACTION OF THE ROENTGEN RAYS UPON THE BLOOD; AN EXPERIMENTAL STUDY

Roger S. Morris, *American Medicine*, Dec. 2, 1905

After reviewing the work of others along this line, Morris describes some experiments which he conducted for the purpose of studying the immediate effect upon the blood of moderately long-continued exposures of the Roentgen rays. Two rabbits and twelve rats were used, the rabbits being subjected to repeated exposures, while the rats were exposed only once each. Medium hard and hard tubes were used with the anode at a short distance from the animal, the exposures being made by Mr. V. G. Willey. In the rabbits the exposures were usually made over the upper left

side of the thorax and the lower left side of the abdomen, the rest of the body being screened from the rays. In one instance the whole of the animal was exposed. The whole of the bodies of the rats, on the other hand, were completely exposed each time.

The first experiments were upon the rabbits with exposures lasting from 15 to 30 minutes, a medium-vacuum tube, anode 5½ inches from the skin being used, spark gap one inch, and the current in the secondary circuit one-half ma. One hour after such an exposure "the number of leucocytes had risen from 9,600 to 12,060; two hours later they had fallen to 9,840, and eight hours after the exposure was stopped, the count was 8,800. The slight rise which followed the exposure was due almost

wholly to an increase in the number of polynuclear amphophiles. With a half-hour exposure (hard tube; distance of anode from skin, six inches) to the lower left thorax and upper left abdomen, the subsequent increase in the number of leucocytes was less marked; there was a rise from 8,000 to 9,720 one hour after the end of the exposure, the increase again being caused by the polynuclears. The count again returned to the original level and remained stationary until eight hours after the exposure; ten hours after, the whites numbered 9,052; at twelve hours, 10,880; and at fourteen, 12,708. The absolute number of the various forms of leukocytes remained practically stationary excepting the polynuclears, which rose in number with each successive rise in the total counts."

Exposures of from  $2\frac{1}{2}$  to  $3\frac{1}{4}$  hours were then employed, the blood for examination being obtained from the veins of the ear (in the case of the rabbits), and the exposures taking place on two successive days. The total number of leukocytes per cubic centimeter before the first exposure was 7,250. A male rabbit "weighing 1,818 gm., was given an exposure over the lower thorax and upper abdomen of the left side, of  $2\frac{1}{2}$  hours' duration (medium tube; anode 7 inches from skin; spark gap, 4 inches; 6 amperes through primary coil; penetration = 6 mm. of aluminum). Two hours after the termination of the treatment the count was 7,820; practically no change. Eight hours after the exposure was ended, there was still really no change, the whites numbering 8,088. At the end of 12 hours a slight increase was noted, 9,776 cells per 1 cmm. being found. The leukocytosis following the exposure, described in the mouse and the guinea-pig by Aubertin and Beaujard, was not obtained, while a slight increase in the count occurred several hours later.

"Though the total number of leukocytes shows little variation during the

first 12 hours following a single exposure to the Roentgen rays, there is nevertheless a well-marked alteration in the absolute number of the different kinds of white cells. Thus, two hours after ending the exposure there is a marked fall in the number of lymphocytes from 3,053 per 1 cmm. (before the treatment) to 1,779. At the same time the polymorphonuclears show an increase from 3,040 to 5,000, a little more than the decline in the lymphocytes. Six hours later there is an increased number of lymphocytes in the peripheral blood, 2,807, rising to 3,343 twelve hours after the completion of the exposure; with the first rise in the lymphocytes there is a small drop in the polynuclears (4,386), the total count remaining about the same, while later on, when the number of whites in the circulation is somewhat greater, the polynuclears also show an increase.

"On the second day (24 hours after the first exposure) the leukocytes numbered 5,000 per cubic millimeter, the lymphocytes being slightly in excess of the polynuclear amphophiles, a condition which Brinkerhoff and Tyzzer found to be normal in the rabbit. The same animal was again exposed to the Roentgen rays (medium hard tube connected with 24-plate static machine; distance from anode ca., 7 in.; 2 in. spark gap; penetration of 8 mm. of aluminum), the treatment this time lasting 3 hours; it was given over the lower thorax and upper abdomen of the left side, as before. Fifteen minutes after the treatment was stopped enumeration of the leukocytes showed 4,844 practically the same as before the exposure was begun, but somewhat less than on the preceding day. Eight hours after ending the exposure there were 6,576 whites, and 10 hours after, they had risen to 13,776. During this time changes took place in the differential count similar to those described above, but somewhat more marked. When the exposure was

ended the lymphocytes amounted to 1,835 in a cubic millimeter (2,421 before exposure); eight hours from the termination of the treatment they had declined to 741, while at the end of 10 hours (13 hours from the beginning of the treatment) 1,622 lymphocytes were found, the total number of whites having also shown a considerable increase.

"No noteworthy changes were found in the number of the red blood cells or in the percentage of hemoglobin. The blood plates were not counted."

The histologic characters of the leukocytes were studied by means of the Wright stain. No changes were noticed until the second exposure, but a preparation taken just at the end of this exposure showed a few lymphocytes "in which the nuclei were apparently breaking up into fragments or spheric masses, presenting a picture similar to that described by Heineke in the spleen and intestinal follicles; their number was, indeed, few, for only three such cells were seen in counting 541 leukocytes. In the same specimen three amphophilic myelocytes were encountered. Many of the polynuclear amphophiles presented poorly staining nuclei. In the differential count of the blood taken eight hours subsequent to the second exposure no changes were found in the form of the lymphocytic nuclei after the examination of a large number of cells, though some of them stained less deeply than normal. The myelocytes had risen to eight in counting 555 cells, and distinct changes were evident in the staining properties of the polynuclear amphophiles; the basophilic granules no longer stained, while the acidophiles were definitely reduced in number, so that the cells suggested strongly those described by Milchner and Mosse in the bone marrow. Two hours later there were four myelocytes in 540 cells counted; the alteration in the polynuclears was somewhat less marked.

"Stained specimens revealed no

special abnormalities in the erythrocytes, nor were nucleated forms met."

Rats appear to be more susceptible to Roentgen radiation than rabbits, and in these animals the examination was limited to the leukocytes which appear to vary normally between 5,000 and 11,000 per cubic centimeter. The mononuclears are considerably in excess of the polynuclears, which latter, unlike those of the rabbit, possess neutrophilic granules.

"Four hours was the length of exposure with nearly all the rats. In the first experiment five of them (Nos. I to V) were exposed to the Roentgen rays (medium hard tube connected with 24-plate static machine, 360 revolutions per minute; anode ca. eight inches from animals; spark gap two inches; penetration = 16 mm. of aluminum). At the conclusion of the exposure Rat I (male, weight 75 gm.) was chloroformed; the leukocytes numbered 3,064, of which 82% were small lymphocytes and 12% polynuclear neutrophiles. While there is probably a leukopenia, the relative proportion of the cells shows no marked alteration and histologically no change was found. The leukocytosis of Auber-tin and Beaujard is absent. Rat II (female with embryos, weight 202 gm.) was killed eight hours after beginning the treatment; 2,000 leukocytes per cubic millimeter were found. The differential count showed about 30% of small lymphocytes with nearly 55% of polynuclears. A few masses resembling poorly staining nuclei without protoplasm were seen, the size varying from that of a polynuclear neutrophile to a body about an eighth that size. Twelve hours from the beginning of the exposure Rat III (male, weight 125 gm.) was examined; the blood contained 2,664 whites. A very marked decrease in the lymphocytes was discovered in making the differential count, less than 2% being found, while more than 95% of the leukocytes were polynuclear neutrophiles.

Rat IV (male, weight 78 gm.) was not killed until 48 hours had elapsed from the commencement of the four-hour exposure. In this animal the most striking changes in the leukocytes were found. There was extreme leukopenia, only 176 leukocytes being found per 1 cm. As would be expected, a great paucity of leukocytes was encountered in the examination of the stained specimens. In going over about one and one-half three-quarter-inch square cover-glasses only 29 leukocytes were found; of these 25 were polynuclear neutrophiles and the remaining cells could not be classified. Not a lymphocyte was seen. The polynuclear cells stained fairly well. It had been planned to kill Rat V (male, weight 56 gm.) 96 hours after the treatment; unfortunately the animal was found dead in the cage. Death must have occurred some time between 80 and 96 hours after exposure. Rigor mortis was present. Autopsy revealed no macroscopic alteration other than a small amount of pale yellowish fluid, slightly turbid, with small grayish-white flakes in the lower part of the peritoneal cavity; there were no fresh adhesions.

"Rats VI to X were exposed to the Roentgen rays four hours (medium soft tube connected with 24-plate static machine, 420 revolutions per minute; anode ca. 8 in. from animals; 1½ in. spark gap; penetration = 8 mm. of aluminum). They were killed 4, 8, 12, 24, and 72 hours after the beginning of the exposure. Suffice it to say that the changes in the differential count were similar to those taken at corresponding times in Rats I to V but less marked. In general the leukopenia was also less pronounced. This may have been due partly, at least, to the fact that a medium soft tube was employed.

"Rats XI and XII received a five-hour exposure (medium tube; four-inch spark gap; six amperes through primary of coil; penetration = 16 mm. of alumi-

num); they were killed 96 hours later. The leukocytes were not counted. I am indebted to Dr. Warthin for letting me obtain the specimens. If one may judge from the stained blood, a marked leukopenia must have existed; the differential count also bears this out, the proportion of lymphocytes being greatly diminished and the polynuclears predominating.

"Comparatively slight alterations in the appearance of the stained cells have been met; indeed, from the very intense changes in the lymphocytes and polynuclears described by Heineke, and which are also shown beautifully in Warthin's specimens, one is surprised to find so few cells showing abnormalities. Occasionally one finds a lymphocyte with few, or, more rarely, many granules in the protoplasm; the latter stain like the nucleus, and the larger ones are about the size of the eosinophile granules of the rabbit. These cells are rather more abundant in some of the specimens, but as they are also found in the blood of apparently normal rabbits and rats, they are in no way specific alterations. Because of the similar reaction to the stain, possibly, the granules are derived from the nucleus."

Morris concludes from his experiments as follows:

"1. The Roentgen rays cause a marked diminution in the absolute number of leukocytes in the peripheral circulation.

"2. Preceding the leukopenia, there may be a moderate rise in the number of leukocytes eight to twelve hours after the exposure, the increase being due largely to the greater number of polynuclear cells in the circulation (observed only in the rabbit); the same condition may be found just at the end of the exposure, subsiding rapidly.

"3. The lymphocytes are especially susceptible to the action of the rays; they are affected first and most intensely.

"4. Alterations in the histologic

characters of the lymphocytes and polynuclear amphophiles may be found in the rabbit, similar to those described in the lymphoid tissue and bone marrow.

"5. Hard tubes produce the most marked changes in the leukocytes.

"6. No noteworthy numeric or histologic alteration takes place in the red blood cells within the first few hours following exposure; the percentage of hemoglobin is not essentially affected within the same time."

#### THE ROENTGEN RAY IN PRIMARY CARCINOMA OF THE BREAST

Aspinwall Judd, *The Post-Graduate*, December, 1905

Judd has had unfortunate experiences in the treatment of primary carcinoma of the breast. He advises immediate operation in all operable cases, followed by application of the ray, even though it is impossible to entirely remove the growth surgically, since in this way the patient is quickly rid of a mass of tissue, the removal of which by X-rays alone, would take considerable time and be attended by a danger of auto-intoxication.

He claims that the danger of opening up the lymphatics by operation, is more than offset by the time gained, and that the ray is powerless to prevent the growth of malignant conditions in deep regions. In every case that he has treated and in other cases treated by other men discharged as cured and afterward appearing in his clinic, death has occurred from recurrence, which death he believes to have been hastened by the ray, it seemingly producing metastasis.

The apparent resolution of lymphatic structures following treatment is caused not by the elimination of the growth, but by the absorption of the inflammatory exudate. In a case of scirrhus of the breast, discharged as cured from his X-ray clinic, and operated on some six months later, extensive lymphatic in-

vovement was found in the axilla. In all the cases treated and operated upon, the only cells which were affected were those lying superficially and directly exposed, while in the outlying areas the carcinomatous tissue was not degenerated.

He reports brilliant effects, however, in the treatment of recurrent conditions by X-rays and is unable to understand the mystery, when the primary growth has proven so stubborn, yet he finds only superficial recurrence to yield, while the deeper recurrences go on much as in the primary conditions; where these deep-seated glands do disappear, he does not believe that they were infected with carcinoma.

Where the case is thoroughly inoperable and the patient in great pain, he believes the X-ray should be used and that from a hard tube only, because a soft tube only continues to break down the tissue and form ulceration. He reports a case in a woman aged 32, having a small carcinoma of the breast with enlarged axillary glands, treated for one month, fifteen minutes each time, three times a week, medium soft tube at six inches. The small ulceration assumed a healthy appearance, but no change was noticed in the growth. During the second month a soft tube was used at a distance of four inches, for five minutes, and a high tube at a distance of nine inches, for ten minutes, three times a week. Within a month an erythema began involving the ulcer and the soft tube was abandoned for a hard one. Within six weeks the ulcer had healed, the growth seemed smaller and the axillary gland unaffected. After another month, the tumor had diminished to one-half the size, and after two months more the patient consented to operation. He performed a Halsted-Meyer and the patient has had no recurrence.

Pathological examination revealed carcinoma with involvement of the

axillary glands. The carcinoma was much more extensive than could be determined by palpation. He assumes therefore that only the superficial portion of the tumor was cleared up by the Roentgen ray, and that the diminution in the size of the tumor and the disappearance of the glands was due to absorption of inflammatory exudate and not effect upon the carcinomatous tissue.

In another case of recurrence in the left breast after the removal of the right by operation, X-ray treatment was employed for four months without apparent change, when the breast was removed and no change was found attributable to X-ray treatment, but on the contrary the pathologist pronounced the growth more luxuriant in the portions subjected to treatment. In another case which he treated for three months with a high tube, at a distance of six inches, fifteen minutes, three times a week, no apparent change took place in the mass, and operation revealed the fact that no change had taken place in the tumor, which was rapidly growing.

The report of the pathologist in the five cases which Judd treated, shows that he found a certain amount of fatty degeneration of the tumor, but this is common. None of the tumors showed necrosis or obliterating endarteritis in any of the carcinomatous areas lying more than ten millimeters below the surface of the skin. The outlying groups of carcinomatous cells were not inhibited, but were more luxuriant than the tissue that had not been rayed.

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#### SOME OBSERVATIONS ON LEPROSY IN THE PHILIPPINE ISLANDS, WITH AN ACCOUNT OF ITS TREATMENT WITH THE X-RAY

H. B. Wilkinson, *Medical Record*, December 9, 1905

This paper was reported in a letter from the *Medical Record's* special correspondent at Manila, Philippine Islands, and was read at the regular

monthly meeting of the Manila Medical Society held October 12, 1905. Dr. Wilkinson reported upon thirteen cases, and the matter is so interesting that we extract from the letter as follows:

"He began the treatment of leprosy with the X-ray during January, 1904, with a ten-inch spark machine, with which he used a bifocal tube. That portion of the patient which presented the greatest amount of infiltration was exposed to the direct rays of the tube at a distance of about ten inches. The exposure lasted about ten minutes and was repeated at intervals of several days. His object was to approach as nearly as possible to the burning point, without actually producing a burn. He called particular attention, however, to the fact that a cure resulted in the two cases which were accidentally burned. After two or three successive treatments, a blushing of the skin is often observed, which is later followed by scar formation. A tabulated statement of the thirteen cases treated showed that three were cured, seven improved, and three not improved.

"He reported one case more or less in detail, because it was the first in which an apparent cure was made: Domingo Panol; male; Filipino; medium size; age 37; admitted July 29, 1904, to the San Lazaro Leper Hospital; clinical diagnosis, hypertrophic leprosy, confirmed microscopically by the Bureau of Government Laboratories, and by examination made by the author. Right side of face showed marked thickening of skin and superficial tissue, elevation being from  $\frac{1}{2}$  to  $\frac{3}{4}$  inches. The thickening was so great that the right eye was nearly closed, and right ear about three times normal size. Large nodule over chin, about the size of a horse-chestnut. Many smaller nodules scattered over face and head. X-ray treatment was begun August 11 and repeated seven times between the latter date and August 23, when it was found that infiltration had

disappeared somewhat, and the right eye could be partially opened. Owing to a burn on the right ear treatment was discontinued until September 4. September 8 treatment was again discontinued on account of burns. October 15 gradually improving; scar tissue becoming apparent on face. Pus taken from nodule on chin shows lepra bacilli. January 12, 1905, abscess detected in right groin and eight ounces of pus evacuated. No lepra bacilli found in latter. Lepromous lesions much improved but general health poor. February 2, microscopical examination of skin scraping from right cheek showed few apparently broken-up lepra bacilli. July 1, 1905, appearance normal so far as leprosy is concerned, but has considerable scar tissue on face. Microscopical examination of skin scrapings taken from previously affected area was negative, so far as lepra bacilli were concerned. Has general anasarca, with anemia and albumin in the urine. July 11, patient died of atrophy of the liver. Autopsy was made by Dr. Herzog, pathologist of the Bureau of Government Laboratories, who reported fatty degeneration of the myocardium and kidneys, with interstitial nephritis. Advanced atrophic cirrhosis of the liver, purulent abscess in anterior abdominal wall. Sections were prepared in Zenker's fluid and stained with hematoxylin, from the left side of the face, from the previously affected ear, from the kidneys, spleen, liver, heart, and several peripheral nerves. No lepra bacilli could be demonstrated. In conclusion Dr. Herzog stated that 'the histological and bacteriological examination of this case furnished no evidence that the patient, at the time of his death, was suffering from leprosy, either cutaneous or internal.'

"In the next case reported as cured, the duration of the disease was two years. The patient received 52 treatments between January 7, 1904, and June 7, 1905, and is alive and well to-

day. Repeated microscopical examinations made up to the present time have always been negative.

"In the third case reported cured, the duration of the disease was two years and the patient received 14 treatments between May 8, 1905, and June 7, 1905. Microscopical examination made August 3, showed several doubtful acid-fast objects which appeared to be broken-up and degenerated lepra bacilli. Examinations on August 11 and 16 were all negative.

"The author is inclined to believe that the cure takes place by the lepra bacilli in the lesion being 'killed' and their bodies absorbed by the system, thereby producing an immunity against the living organism.' In support of his theory, he states:

"1. The treatment of one lepromous spot on a patient produces improvement in spots at a distance from the one actually treated.

"2. The cure in the distant spot seems to progress parallel to and to be just as complete as that in the one treated.

"3. The best results seem to be obtained only when treatment is pushed to the point of killing or beginning to kill the tissues, which would also probably be to the point of killing the organisms.

"4. Cases in which there are massive localized lepromous deposits as in case No. 5, are most rapidly improved, as in these cases we have an abundant culture on which to operate and thereby produce immunity more rapidly.

"5. In diffuse general involvement of slight degree or atrophic character where there are only a few scattered organisms we have had little success.

"6. In two well-advanced cases where the amount of new lepromous tissue was excessively great, the improvement was marked and rapid, but followed by loss of general health and rapid physical decline. This may be an over dosage, so to speak."

THE FINSEN LIGHT TREATMENT  
 Albert Soilard, *Southern California Practitioner*, December, 1905

Soiland has spent some time at the Copenhagen Finsen Light Institute, and believes that there is only one apparatus which will give Finsen light which is effective for therapeutic purposes, and that is the Finsen lamp. As the treatment is applied at Copenhagen the area to be exposed is outlined with blue pencil and the exposure lasts one hour. Within 24 hours after the exposure there appears "an intense erythema with vesication of the parts so exposed. This erythema or reaction subsides in about ten days, at which time it is found that more or less improvement has taken place, according to the severity or chronicity of the disease. A very superficial lesion therefore yields to one or two such exposures, while a chronic, deep-seated one requires a great many treatments. Each area treated is about the size of a half-dollar, and the treatment cannot be repeated to the same spot before the reaction has subsided. Contiguous areas can of course be treated daily, until the whole lesion has been covered."

The affections which yield most promptly are lupus erythematosus and vulgaris, non-elevated angioma, rodent ulcer, superficial epithelioma, acne, and eczema. These cases really get well and a vast majority of them stay well.

ÆSCULIN IN CONJUNCTION WITH  
 FINSEN LIGHT IN THE TREAT-  
 MENT OF LUPUS VULGARIS

George H. Graham, *London Lancet*, Dec. 16,  
 1905

Graham has given over 100 injections, of five minims each, of a 5% solution of aesculin in the treatment of cases of lupus vulgaris, exciting fluorescence of the solution thus injected into the tissue by the use of the Finsen-Reyn light. He says the reaction following an ordinary Finsen sitting is usually over by the third day, but that after sensitizing

the tissue by injecting aesculin he has observed it to last for from four to seven days longer. He has also noticed that Finsen sittings give stronger reactions than normal when applied to the neighborhood of an injection, even from four to five days after the injection.

He has demonstrated that fluorescence is excited by the Finsen light in tissues thus injected, in the following manner: "I had injected under the shaved skin of a guinea-pig five minims of a 5% solution of aesculin. Having removed nearly three square inches of skin together with the subcutaneous tissue and some muscle, and stretched it over a ring I passed the 20-ampere carbon arc-light through the Finsen-Reyn apparatus onto it exactly as if the patient was being treated, and found the whole of the skin (one millimeter thick) and subcutaneous tissue very fluorescent. Where the muscle remained attached the fluorescence was not so evident, the tissues there being at least three millimeters thick."

He believes that this use of aesculin is particularly advantageous in the treatment of obstinate tuberculous nodules that sometimes remain after a prolonged course of ordinary Finsen treatment has cleared up lupus in surrounding structures, and has seen such rapidly disappear after having been sensitized, although they remained obstinate to the light before sensitization. He has also found the aesculin injections to be of assistance in softening thick fibrous scars similar to keloid, which sometimes follow the scraping of lupus patches and result in recurrence.

It is pretty universally considered that it is the blue and violet rays rather than the ultra-violet that are effective in curing lupus by the Finsen light, and he believes that the efficiency of the aesculin injection arises from the fact that the aesculin absorbs ultra-violet rays, which absorption gives rise to rays lower in the scale, probably corresponding to the

violet and the blue; these rays are therefore excited throughout the whole field injected and are brought into intimate contact with the diseased tissues.

#### A NEW METHOD FOR THE THERAPEUTIC APPLICATION OF RADIUM SALTS

William H. Dieffenbach, *North American Journal of Homœopathy*, Dec., 1905

The author had for several years previously experimented therapeutically with radium salts contained in hermetically sealed glass and aluminum tubes, first with activities of 7,000, 12,000, and 20,000 in quantities of 10 milligrammes, later in the highest activities obtainable, the so-called one millionth, in the same quantity. Therapeutic success was obtained in isolated cases of skin disease—naevi, verruca, urethral caruncle—but as a whole, the sphere of usefulness was limited, and extension of the same with the means at hand quite doubtful. It was at this stage that Dr. Henry G. Piffard, of New York, called his attention to the discovery of Mr. Hugo Lieber, chemist, New York, who had some time previously succeeded in dissolving radium salts in such a manner as to form a film or coating on suitable appliances, offering a method of securing all the rays and emanations given off by the radium salts without immediate loss of substance, such as would occur if pure radium or aqueous solutions were applied directly. As radium radiations consist of about 95% of alpha rays alone, which owing to their lack of penetration, are entirely cut off by glass, aluminum, mica, or even rubber, the possibility thus afforded of utilizing the unknown therapeutic factor of alpha rays in conjunction with the beta and gamma emanations gave hope of great results. The beta and gamma emanations were also enormously increased in quantity through this new method so that a means of employing the full or almost the full radium output was available.

Aqueous solutions of radium bromide being impractical in this connection, the inventor, Mr. Hugo Lieber, experimented with mixtures of wood alcohol, acetone, amyl acetate, to which organic acids were added, depending on the character of the material to be filmed or coated with the solvent.

The solvent was required to be of such character that the surface of the appliance to be coated was softened and the radium solution readily imbedded in it. Another quality required of the film or coating was permeability and elasticity. The inventor found celluloid in the shape of rods and plates most suitable; later on, at his suggestion, hard rubber bougies for official application (vagina, rectum, etc.,) were successfully coated.

There are as yet no reliable data to refer to in the treatment of cancer with this agent, and it was incumbent to act conservatively, noting the action of the radium on the tissues from time to time, and ceasing its application when dermatitis was produced.

In cases of lupus vulgaris, the radium coatings were usually placed upon plaques of celluloid and these were cut to suit the part to be treated. The same method was employed in discoid epithelioma, naevi, verruca, and psoriasis. The radium plaques are firmly strapped to the lesion and held in place by means of adhesive plaster and usually kept *in situ* for two days. The parts were then examined, and if, after four days, radio-erythema was marked, treatment was suspended, to await results of the reaction.

He reports absolute present success in cases of flat epithelioma, of small lupus vulgaris, epithelioma of the lip and tongue, all of which must await the usual term of years before danger of recurrence is passed.

In several hopeless cases of epithelioma involving large surfaces our results are still *sub judice*, in others failures resulted.

It is held that the application of radium as outlined is a distinct step forward in the treatment of a class of diseases which have been the *crux medicorum* for centuries, and it is to be hoped that the medical profession will take cognizance of it, and give it a thorough trial especially when confronted with an otherwise hopeless case.

Since the reading and discussion of this paper at Liege, Mr. Lieber has followed up his experimental work in this line and has secured what he considers an improvement on the above outlined methods. It was found that the radium as formerly applied would destroy cells of malignant growths to a greater extent than normal cells, so that, by proper timing, necrosis of the former could be induced without absolute destruction of the latter, thus permitting regeneration of tissue in the affected area. It was also found that the destructive effect of radium rays was confined to a small area, estimated at 2-3 centimeters, surrounding the tissue where the application was made. This, it was thought, might be due to the fact that the fluids of the parts treated formed with the radium salts an insoluble radium sulphate which was not readily absorbed into the deeper structures. This is obviated by making a mixture of radium bromide and gelatine which is

easily absorbed, and experiments are now under way to prove its efficiency.

#### CONCERNING THE EMANATIONS OF THORIUM GIVING A NEW RADIOACTIVE ELEMENT.

O. Hahn, *Jahrbuch der Radioaktivitat und Elektronik*, October 26, 1905

During the process of separation and fractioning of radium and thorium, the author found emanations from a new element to be present. This element is easily carried with radium and thorium, and therefore most difficult to isolate. This element is found to give solutions a brown color, and to impart radioactivity to these solutions, and to the filter through which it has passed. When a current of air is blown through the solution and this current of air carried upon a zinc-sulphide screen the eye can appreciate the illumination, providing it has become accustomed to the dark-room. This light then disappears and after a time returns again. This new element is recognized in the emanations of thorium, and the author refers to it as radio-thorium. This element in a water solution gives off from 10 mg. 120,000 times as much emanations as 50 g. of thorium-nitrate. It differs also from radium. The author has not yet completed his investigations and simply makes this as a preliminary report.

## DIETOTHERAPY

### URIC ACID AND DIET

F. C. Eve, *The London Practitioner*, December, 1905

This article is an attempt to review briefly and dispassionately the position of a dietary from which is eliminated any food containing uric acid or any of its congeners. "Purin-free diet" is the modern name for it. Uric acid is the most important purin, but others are xanthin, hypo-xanthin, thein, caffein,

theobromin.

From a purin-free, or uric-acid free diet the flesh of all beasts, birds, and fishes, and any soups made from them must be excluded. The only food of animal origin which is permitted is milk and milk products, such as cheese and butter. Eggs occupy an uncertain position. They contain no purins themselves, but in many individuals they increase the excretion of uric acid in the

urine. White bread and all vegetable foods are purin-free except peas and beans, asparagus, onions, mushrooms, tea, coffee, chocolate, porridge. This diet is even more restricted than a vegetarian's.

The credit of originating this diet and of working it out chemically and clinically belongs to Dr. Alexander Haig. He did an immense amount of valuable pioneer work on the influence of drugs and diet on the excretion of uric acid. He believes that the uric acid circulates in a gelatinous form, raising the blood-pressure, obstructing the kidneys and acting as a chronic poison, causing languor, depression, headaches or irritability in the present, and arterio-sclerosis or any of his list of uric-acid diseases in the future.

In an ordinary person, on an ordinary mixed diet, of the uric acid and other purins which appear in the urine, only about half are due to the necessary wear and tear of the body; the other half are simply due to purins needlessly imported in the food. The former moiety is of course inevitable, but the latter moiety is avoided in a purin-free diet, and the body is thereby saved the needless labor of transforming and secreting all these unnecessary purins.

Dark meats and white meats contain about equal quantities of purins. Fish contain a good deal, though often about 50 per cent. less than meat. Beer and stout contain traces of purins, but there is none in wines and spirits. Nevertheless, alcohol may, in some exceptional persons, cause a large increase of uric acid in the urine, even after a very small dose.

Walker Hall, on the other hand, thinks that the clinical ill-effects of flesh foods are due rather to the nature of the "uric acid combinations" in the blood than to the quantity of uric acid, *i.e.*, as to whether these combinations are irritating or the reverse. He considers that in health uric acid is a necessary stage in nuclein metabolism; that

in disease uric acid is merely a symptom of conditions which hinder its solubility; and that uric acid is not the cause of the lesions.

The primary question is— are circulating purins capable of acting as chronic tissue poisons? There is a considerable accumulation of clinical and experimental evidence, tending to prove that purin bodies do act as tissue poisons, particularly in susceptible individuals, and where the cleavage of the proteid molecule proceeds abnormally.

Mr. Fletcher, a confirmed dyspeptic, over fifty years of age, regained health and strength by prolonged mastication. He found that the body and mind could in this way be kept in extraordinary health with a half or a third of the ordinary consumption of food. The appetite was satisfied, and the gymnastic strength and endurance evolved were surprising.

Professor Chittenden investigated the question of the minimum amount of nitrogenous food necessary to maintain health and strength in five professional men, eight university athletes, and thirteen soldiers. These experiments were of long duration, none of them being of less than four months, while some lasted a year. His results prove that, for at least this length of time, these types of men can subsist on half the 120 grams of proteid food which was formerly considered necessary to support life, this latter being very much less than the amount ordinarily consumed. On this diet, which was limited only in quantity, and not in quality, his subjects gained in strength and health, and did their muscular and mental work better, while those who suffered from headache or biliousness left these indispositions behind. Nearly all the soldiers on the prescribed and limited, but purin-containing diet, excreted uric acid of endogenous origin only.

A chief result of all these systems, vegetarianism, the purin-free diet of

Haig, the prolonged mastication of Fletcher, or the limitation of nitrogenous food of Chittenden, is that the *quantity* of nitrogenous food is diminished.

This subject is of importance in connection with the following diseases: gout (especially with asthma or eczema), migraine, chronic rheumatism (genuine) in all its forms, lithæmia, biliaryness, inadequacy of the liver or kidneys, and probably high blood-pressure, arterio-sclerosis, and some forms of neurasthenia.

#### THE IMPORTANCE OF THE FIRST STEPS IN ARTIFICIAL FEEDING OF INFANTS, WITH PRACTICAL POINTS ON THE USE OF TOP MILK MIXTURES

J. G. Gittings, *Jour. A. M. A.*, December 2, 1905

Good results in infant feeding can be obtained with the use of the top portion of good ordinary milk bottled under fair hygienic conditions. A little personal investigation of one or more dairies will often enable the physician to recommend a useful product at market rates. The excessive variation of the fat content is largely compensated for by the necessary dilution. The proteid is much less likely to be variable, and while the percentage of this and of sugar decreases as that of fat increases, for practical purposes allowance need only be made for this when we use 13 or 16 per cent. cream.

Certain other matters are just as important as the strength of the milk. The proper interval of feeding should be more strictly adhered to than the amount or strength of the mixture. Save in exceptional cases, such as illness, etc., the following rules may be advocated: During the first two months of life the interval between feedings should be two hours; during the second two months two and one-half hours. After the fourth month the interval should be three hours.

The amount given at different ages may be approximately stated as follows: First week one ounce; second and third weeks, one and one-half ounces; fourth week two ounces. From the second to the seventh month, inclusive, the amount of mixture in ounces varies from the number of the month to one in advance of it; for example, third month, from three to four ounces; fifth month, from five to six ounces, etc. It rarely will be advisable to give more than eight ounces at one feeding.

As regards the strength of the milk mixture it may be assumed that the average healthy infant can digest whole cow's milk at the age of from eight to twelve months. Some can do it earlier and others will be unable to digest whole milk at any time during the first two years of life. The first three months is the crucial period when mistakes are most frequently made, and during this period the strength of the first milk mixtures should be: fat, 1.5 to 2%; sugar from 4 to 5%; proteid, from 0.5 to 0.75%. By the third or fourth month the fat should have been increased to from 2.5 to 3.5%; sugar to 6%; and proteid to from 1.5 to 2.5%. From the eighth to the twelfth month the full strength of whole milk should have been reached.

The cardinal points to be noted are the condition of the child's digestion, the gain in weight, and the appetite. The importance of frequent (bi-weekly or weekly) weighings is emphasized; a healthy child should gain from five to seven ounces a week during the first four months of life, from three ounces to five ounces during the fifth, sixth, and seventh months, and from two to four ounces from the eighth to the twelfth months.

A knowledge of the strength of top milks is requisite; the upper sixteen ounces of average (4% fat) milk, contains approximately 7% fat; the upper 11 ounces, 10% fat; the upper 8 ounces, 13% fat, and the upper 6 ounces, 16% fat. The proportion of proteid to 7% cream is

about 2 to 1; in 10% cream 3 to 1; in 13% cream, 4 to 1, and in 16% cream 5 to 1. In the whole (4% fat) milk the ratio is about 1 to 1. The sugar content is more constant, averaging near 4½%.

With these figures the proportions of different milk mixtures are easily calculated. The amount of sugar needed for the proper nourishment of an infant is from 5 to 6%, and to supply this in the mixture it should be added to the diluent in proper proportions. The instructions given on these points by Gittings are rather detailed and a list of formulas is appended.

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#### THE WATER SUPPLY IN SHIPS FROM ITS BEGINNING TO THE PRESENT TIME

Henry G. Beyer, *Jour. A. M. A.*, December 16, 1905

Beyer gives an interesting history of the methods of ship water supply from an early period down to the present time. The old-fashioned wooden water casks that were so long in use were conducive to putrefaction, and were practically septic tanks. There was danger also of water being contaminated not only at its source but also in its transmission to the ship, and the methods of keeping water sweet by the addition of quicklime, by charring the inside of the casks and by

sulphurization, were all more or less ineffectual. Iron casks also had their drawbacks, and the method of cementing the interior of water tanks is the only provisional satisfactory solution of the problem. The correctives of aeration, etc., employed by the older navigators are also mentioned. Distillation did not come early in favor owing to a prejudice which still exists to some extent, and its introduction was slow, even in modern times, owing to imperfections in method. Filtration by portable filters has been shown to be objectionable by many authorities, and the difficulties are accentuated in warm climates. Beyer describes the plans that have been proposed for obtaining a perfect water in ships' tanks and keeping it for use in an uncontaminated condition. The substitution of sterilization for distillation is a question of the present time that has to be squarely answered in the near future, and recent French experiments seem to make the prospect of its satisfactory working rather favorable. Beyer believes that there is no subject in the range of naval hygiene in regard to which the prospects are more satisfactory, and there is no other problem which illustrates better the slow but sure evolution of hygiene than does the gradual evolution of the water question on shipboard.

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#### MECHANOTHERAPY

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#### CHRONIC HEADACHE AND ITS TREATMENT BY MASSAGE

Gustaf Norstrom, *N. Y. Med. Jour. & Phila. Med. Jour.*, Nov. 4, 11, and 18, 1905

The importance of this topic and the skill of the writer make this paper of special value to the general practitioner of medicine, who is often seriously disappointed in the results of treatment of this common ailment.

Dr. Norstrom published in 1885 a book on the treatment of headache by massage, and there he attempted to show that there were forms of head pains that

were due to inflammatory deposits in the muscles of the neck and head, that were kindred with the pains found often in other parts of the body. That these neuralgic headaches constitute a large percentage of the cases of cephalgia that are included under different names without very definite diagnostic delimitations is believed by Dr. Norstrom, and the results of this form of treatment seem to justify the claim made by him that the source of the irritation is usually peripheral, and can be relieved by improvement of the peripheral circulation and

stimulation of the sensory and trophic nerves that have become involved in the hyperplastic area.

On the other hand he does not hold to the extreme theory that all extracranial cephalgias are of muscular origin or that all cases of chronic myositis of the neck produce pains of cephalalgic character, nor does the author claim that all cases of myositis accompanied by headache are to be cured by the procedure that he advocates for appropriate cases. In other words he does not claim that massage is infallible and has no contraindications.

The causes that have most frequently been active in the cases treated have been those of a rheumatic nature. The attacks have been incited by changes of climate, emotional excitement, and almost any change in the ordinary habits of life. The myositis is usually slow in its progress and only when there is sudden exacerbation of congestion in that locality is there likely to be headache, thus explaining the periodicity of the pain. At such times there is sure to be thickening and soreness of the muscles about the nape of the neck, and in most persons there will also be found sensitive areas, and a family history of rheumatism.

The myositis is nearly always found located at the cranial insertion of the muscles, rarely in their bellies. Sometimes there are sensitive points on the scalp and even the whole scalp may be swollen and painful to pressure.

It is not probable that the nerve lesion is always that of neuralgia or neuritis; it may be simply pressure on the nerve filaments that gives rise to the pain, or there may be a perineuritis due to irritant products about the nerves. Attention is called to a false neuralgia where nerves are the seat of pain without being tender to pressure and without swelling. This pain seems to be a communi-

cated sensation that may come from anastomosing fibres that come from nerves that are irritated, or from reflex action.

At times there is found pain and swelling on the level of the upper and middle cervical sympathetic ganglia, but this does not afford a contraindication for massage. Sometimes the glands adjacent to the muscular inflammation become involved and the swelling may be extensive.

Examination of a case is advised during the exacerbation of the disease as the diagnosis is much more certain as to myotic swellings at this time and no damage to structures is necessary. The pains that may be remote from the muscles of the neck will then be found to have a direct relation with the myositis and pressure on the neck may elicit pain in the vertex or even in the region of the orbit. The pain will always be found on the side of the myositis and the sympathetic ganglia of the same side are the ones affected.

The following varieties of cephalalgia have a relatively unfavorable prognosis: (1) very old cases, (2) concomitant general affections of the nervous system, (3) concomitant cephalalgia from chloroanæmia, (4) continuous cephalgias when of central origin.

The technique of the massage is referred to as found in full in the author's "Treatise on Theoretical and Practical Massage," but attention is called to the value of simple skin frictions at first, followed by vibration and deep pressures. The strokings should be from periphery toward the center. The value of the thumb in manipulations to promote absorption is emphasized. At first the movements are likely to be painful, but the immediate result of the treatment should be a numbness followed by diminishing sensitiveness that is gradually reduced to normal. Recurrence of the trouble may occur but is not the rule.

## CLIMATOTHERAPY

### FRESH AIR AND REST IN THE TREATMENT OF PULMONARY TUBERCULOSIS

G. R. Pogue, *Medical Record*, Dec. 9, 1905

Fresh air and rest, which are perhaps the most important factors in the treatment of pulmonary tuberculosis, will prove of little advantage unless they are employed in strict accordance with the therapeutic indications and tempered to suit individual cases. Fresh air, out-door life, and exercise prescribed indiscriminately have frequently led to disastrous results. A man in the early stage of the disease, with little or no breaking down of tissue would require different treatment and could stand more hardships incident to out-door life, than a frail woman with more advanced lesions. Yet the author (who is evidently a Colorado practitioner) sees all classes of cases, in all stages of the disease, put on practically the same line of treatment, with no regard for the individual, and still a feeling of disappointment is manifested because results are not more uniform.

The history of tuberculosis proves that it is essentially a house disease, that is, it is harbored and spread by unhygienic conditions, overcrowding, and lack of fresh air and sunlight. Even in the abodes of the well-to-do evil conditions are too often maintained by those who fear the bad effects of night-air, or the decolorizing influence of sunshine on their carpets and rugs. These persons practically live day and night shut up in a box, breathing over and over again the same air, and enjoying no sunshine except when they leave the house. The lack of fresh air is thus often carried to an extreme by uninstructed persons who do not know the harmfulness of this deprivation.

The other extreme is represented by the medical practitioner who carries the fresh air treatment of tuberculosis so far in the opposite direction that his patient

is injured rather than benefited. It is sheer folly according to Pogue to place a patient with high fever, chills and sweats out of doors all day long in cold weather and then require him to sleep in an open tent, with no provision made for the comforts of life to which he has been accustomed. Another patient in the first stage of the disease is simply ordered to live in a tent, and being ignorant of the laws of ventilation, or fearful of the injurious effects of night air, he closes himself up so that no outside air may get in, and virtually spends eight to ten hours each night in a closed canvas box. Again comes failure.

Patients who are fit for out-door treatment must be kept in the air all day, and practically the same conditions must prevail at night. But they must be made comfortable, and be protected from cold winds, rains, and storms, and, during the summer months, from the direct rays of the sun. For male patients, especially those with no extensive lesions, a tent life may prove very satisfactory, particularly during the warmer months of the year, but for those in more advanced stages and for all cases during the winter and spring the open room and sheltered porch are much more desirable.

According to the author there is no part or element in the treatment of tuberculosis that has been more abused and has brought greater disaster to the patient than exercise and gymnastics. Rest and exercise must be graduated to suit each case, and while there is little fear that the patient will not get enough exercise there is great fear that he will not get the required amount of rest. A knowledge of the pathology of tuberculosis teaches us that rest must be one of the essential factors if we expect to get an arrest of the process, the same as in any other infectious disease as pneumonia, typhoid fever, etc. Tuberculosis differs from other microbial diseases in

that the tissues in their attempt to destroy the invading micro-organisms, build about them a non-vascular structure histologically known as tubercle, in the center of which are the imprisoned bacilli, hemmed in by a more or less impervious capsule, but there is always present the danger of a spread of the disease from rupture of the walls during resolution, and it is here that active exercise gets in its deadly work. Should rupture take place into an open bronchus and the contents be carried out with the secretions, little or no harm results, but if the rupture takes place into the parenchyma of the lung or into the blood-stream, the results would be quite different, *viz.*, an acute exacerbation of the disease, or an acute general miliary tuberculosis. Exercise favors the absorption of toxins, while quiet and rest oppose it.

In all acute (tubercular) processes the elaboration and absorption of toxins is greater for two reasons: (1), the young and growing tubercle bacilli produce more toxins, and (2), in the young tubercle the wall is less dense, allowing the escape of toxins from the infected centers. The greater the amount of toxins absorbed, the higher the fever with its accompanying destructive influences. In the face of these pathological facts, we are justified in demanding rest in all cases of active tuberculosis, no matter how minute the lesions, and more especially when even mild exercise causes a rise of temperature. The author fails to find anything except that which is imaginary in exercise, whether athletic or the so-called pulmonary gymnastics, that is of any benefit to the individual suffering from pulmonary tuberculosis. Granting that rest in itself does not add to repair, it surely prevents the occurrence of those conditions that bring about degeneration and destruction of tissue, and thereby aids the physiological processes that tend to repair and to produce greater resisting power in the economy.

## RESULTS OF THE OPEN-AIR TREATMENT OF SURGICAL TUBERCULOSIS

W. L. Halsted, *American Medicine*,  
December 2, 1905

Halsted's paper is chiefly occupied with the histories of eleven cases of surgical tuberculosis, including disease of the joints, lymphatic glands, and bladder, occurring under his observation between the years 1890 and 1905. The results of the open-air treatment which supplemented the surgical procedures in these cases is exceedingly striking. Halsted believes in fact "that most cases of surgical tuberculosis would recover without operation if they were given a fair opportunity in the open air." He would not be surprised if it should prove to be in general, an easily curable disease.

His hardest task has been to "persuade the relatives, friends, and, alas, the physicians also, of the patients, of the necessity of taking so much trouble and of instituting so much disturbance of the even tenor of the family's existence, or of involving themselves in such unanticipated expenditure. Unless acquainted with the lamentable results usually obtained in the treatment of cases such as these herewith presented, one can hardly comprehend what has been accomplished by the open-air treatment and realize what assurance it holds for the future. "How eagerly we should welcome an achievement which properly curtails the indications for the practice of surgery, a therapeutic measure so crude and often so mutilative." In the larger multitude of cripples from the ravages of tuberculosis the author finds an overwhelming proof of the inadequacy of past methods of treatment. The story presented by the cases narrated offers a sharp contrast to that of the usual course of this disease. "In not one instance did the disease make the slightest appreciable advance after the treatment was inaugurated. The restoration of function was perfect in all save

one and in that it was excellent."

The surgeon's duty is by no means done when he advises his tuberculous patient to live out of doors. He must, if the patient's means permit and if other localities promise decidedly more than home, send him away and entrust him to a physician or companion who will assume the responsibility of insuring a continuous out-door life. Halsted emphasizes the importance, in some instances, of keeping the patient out of doors every hour of the twenty-four, even during the winter season.

He does not discuss the subject of climate or the relative merit of different localities. A majority of his patients have been sent to Saranac Lake in the Adirondacks for the reason that it was possible at that point to secure the advantages of an excellent sanatorium and the services of men trained in the out-of-door methods of treatment. Excellent results were an invariable rule in the Adirondack cases. But in three cases not sent to the Adirondacks nor to any sanatorium but spending the entire twenty-four hours out doors in other localities, perhaps the best results of all were obtained, or at any rate the most rapid strides toward recovery were observed.

The paper is a valuable addition to the still meagre literature of the out-door treatment of surgical tuberculosis. It indicates that fresh air out-of-doors is as

valuable an addition to the treatment of this affection in inland localities as it has already been demonstrated to be at the sea-shore.

#### CLIMATIC TREATMENT OF CIRCULATORY DISEASE

Louis Faugeres Bishop, *Jour. A. M. A.*,  
December 2, 1905

Bishop finds the climate of the lower Maine coast especially beneficial in cases of secondary low arterial tension, even when accompanied by such accidents as hemiplegia. The climate of the lower Maine coast, he says, has a remarkable combination of dryness with sea air and low temperature in summer. It is beneficial in all cases of physical exhaustion and to patients who require a restoration of vitality after disease, but not to those suffering from purely functional nervous affections requiring rest. It is too stimulating for such cases. Still patients with a tendency to melancholia and depressed conditions are much improved. The physical effect of the change from the climate of New York to that of the lower Maine coast is remarkable, and many persons find a stay of over six weeks too stimulating, and therefore go inland for a few weeks during the middle of the season. His observations were made at New York. Three striking cases of benefit from the climate in the conditions mentioned are briefly reported.

## BOOK REVIEW

### RADIOTHERAPY IN SKIN DISEASE.

By Dr. J. Belot. With a preface by Dr. L. Brocq, Physician to the Broca Hospital, Paris. Translated by W. Dean Butcher, M. R. C. S., Surgeon to the London Skin Hospital. The only authorized translation, with thirteen plates and twenty-eight illustrations, 463 pages. Published by Rebman Company, 1123 Broadway, New York, and Rebman Limited, 129 Shaftesbury Avenue, W. C., London.

The author reviews briefly the history of Roentgen's discovery and then gives the various sources of electricity suitable for the production of the X-ray with

directions for adapting each. The biological and physiological effects are then studied, followed by a treatment of the various diseases.

One of the most important chapters is that upon the Methods of Exact Measurement in Radiotherapy, a subject which has been much neglected in America.

The author has reviewed very well the work done both in Europe and America, and presents his views and the accepted views of the profession in a clear, concise, and thorough manner. In general it is probably the best book written upon the subject to date.

## SPECIAL ANNOUNCEMENT

# A Fifty Dollar Cash Prize to the best radiographer

When we undertook to publish THE ARCHIVES OF PHYSIOLOGICAL THERAPY, one year ago, it was our determination to make it the best and most useful periodical of its class in the world, and we feel that the attainments of the past year have been very satisfactory as regards our present product. We have decided to improve it still farther, however, and to this end we now offer a Cash Prize of Fifty Dollars for the best skiagraph sent in for publication as a Special Plate before May 1, 1906.

### ELIGIBILITY AND CONDITIONS

Every one doing X-ray work is eligible for this contest *except the members of our editorial staff and the judges who will decide the contest*, and any portion of the human anatomy may be selected as a subject. The conditions are as follows:

First, that the skiagraph shall have been made personally by the contributor.

Second, that it shall not previously have been reproduced in any publication, periodical, pamphlet, or reprint for public, private, or special sale or distribution.

Third, the contributor's name and postoffice address, a description of the subject of the skiagraph and full details as to the technique employed in its production, character, make, and size of exciting apparatus and tube, distance of anode from plate, time period of exposure, whether or not intensifying screen, diaphragm, or compression was used, make of photographic plate, and composition of developer, shall be recorded plainly upon a piece of paper accompanying, but detachable from the skiagraph. The skiographs will be numbered to correspond with these records so that the judges will render their decisions by the number of the skiagraph, and the maker's name will be made public only after the winner is announced.

Fourth, three dollars for one year's subscription to the ARCHIVES shall accompany each skiagraph submitted.

### THE JUDGES ARE AS FOLLOWS:

DR. HENRY HULST, GRAND RAPIDS, MICH.,

*President of the American Roentgen Ray Society.*

DR. ENNION G. WILLIAMS, RICHMOND, VA.,

*Professor of Pathology in the Medical College of Virginia.*

DR. EUGENE WILSON CALDWELL, NEW YORK CITY,

*Director of the Edward N. Gibbs X-ray Laboratory, University and Bellevue Hospital Medical College, New York.*

DR. PRESTON M. HICKEY, DETROIT, MICH.,

*Radiographer to the Children's Free Hospital of Detroit.*

DR. MIBRAN K. KASSABIAN, PHILADELPHIA, PA.,

*Director of the Roentgen Ray Laboratory of the Philadelphia Hospital.*

The selection of the winner will be determined by (1), skiagraphic excellence, (2), diagnostic utility.

As soon as these gentlemen have reached a decision a check for Fifty Dollars will be forwarded to the successful contestant, and the winning contribution will be published in our next issue.

All skiagraphs to be entered for this contest should be sent to Dr. C. E. Skinner, 67 Grove Street, New Haven, Conn., so as to arrive there not later than midnight of April 30, 1906. Note carefully the conditions laid down, as failure to fulfil any one of them will cause the skiagraph to be rejected at once.

**RICHARD G. BADGER, THE GORHAM PRESS**  
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VOLUME III No III

MARCH 1906

WHOLE NUMBER XIV

## EXPERIMENTAL STUDIES ON THE DENSITY OF CALCULI OF THE URINARY TRACT

BY CARL BECK, M.D., OF NEW YORK CITY

*Professor of Surgery in the New York Post-Graduate Medical School and Hospital; Visiting Surgeon to the St. Mark's Hospital and the German Poliklinik; Consulting Surgeon Philanthropic Hospital.*

THE calculi of the urinary tract consist of salts or other ingredients of the urine, precipitated from the latter. This formation may be due to a peculiar diathesis, but in many instances it is provoked by an inflammatory process within the renal sphere which causes chemical changes, and which is induced by bacterial influence. During this process lime salts are precipitated. We observe a slight analogy to this process in other tissues which are either the seat of a slow chronic inflammation or of a degeneration of some kind (necrobiosis), as for instance in tuberculous foci in the lungs or the tendons, also in endocarditis, pericarditis, old pleuritic bands, uterine myomata. It seems as if the necrobiosis itself had a sort of magnetic effect, so to speak, on the dissolved calcareous salts, inducing them to amalgamate. And in the renal epithelium often calcareous deposits are found without showing marked petrifaction.

The constituent elements of calculi of the urinary tract are oxalate of lime, phosphate of lime, carbonate of lime, uric acid, urates of soda and ammonia, cystine (cystic oxide), and xanthine or uric oxide.

This chemical composition determines the greater or lesser depth of their shadows when the calculi are exposed to the Roentgen rays. The greater their atomic weight, the greater their density, and consequently the more distinct the shadow. Thus calculi composed of oxalate of lime, show the most distinct shadows, which are even deeper than those of bone tissue. Thus we may sometimes be able to determine by the extreme depth of the shadow, whether the calculi are of the oxalate type. Next in order we find those consisting of phosphate of lime, while the uric acid calculi, also the very rare cystines and xanthines, give the faintest shadows.

The constituent elements of the oxalates as well as of the phosphate calculi are calcium and magnesium, while the

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## THE DENSITY OF CALCULI

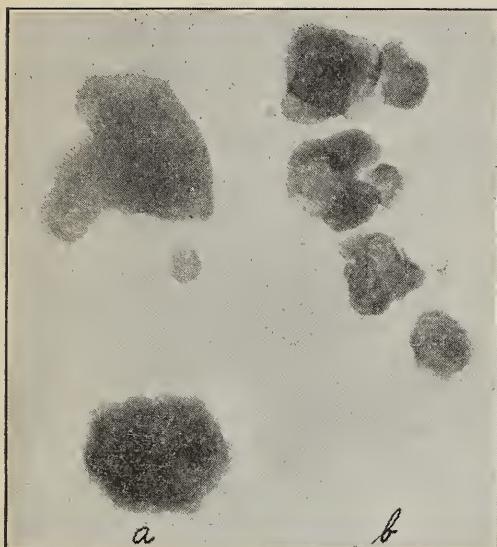


Fig. 1. Exposure three minutes, moderately hard tube.



Fig. 2. Exposure three minutes, soft tube.



Fig. 3. Exposure four minutes, soft tube.

*Figures 1, 2, and 3 show Calculi skiagraphed without Diaphragm.*

urates are composed of potassium and sodium, the atomic weight of the latter being 40, that of potassium 39, phosphorus 31, magnesium 24, and sodium 23. The specific gravity of calcium is 1.6, potassium 0.9, phosphorus 2.0, magnesium 1.7, and sodium 1.0.

In practice, however, we often find that calculi are not of one distinct type, and if they are, layers of various degrees of density are observed. Two strata are

crystalline layer of the carbonates of magnesium and ammonium (photograph). then generally present, one or the other character predominating. So it will frequently happen that there is a nucleus of uric acid surrounded by alternate layers of the other elements. Fig. 4, for instance, illustrates five different layers in a vesical calculus.

This also explains why, in skiaigraphy, at least some dense areas are observed in every urinary calculus. The same is true when the calculi are of small size, like the small renal stone illustrated in Fig. 1, a.

Still the question of composition is of less importance in the process of skiaigraphy, than that of bringing the calculous area as near to the photographic plate as possible and keeping the field absolutely quiet.

These two requirements are attained by the use of a tubular diaphragm which offers another great advantage, that of permitting the passage of the focal rays alone, thus excluding the vagabond rays, viz., those emanating from the tubal wall (see illustrations of "Eine einfache Stellrohrblende," *Muenchener Medicinische Wochenschrift*, No. 41, 1903, "Recent Advances in Roentgen Ray Diagnosis," New York, 1904, and "Archives of the Roentgen Ray," etc., London, February, 1905).

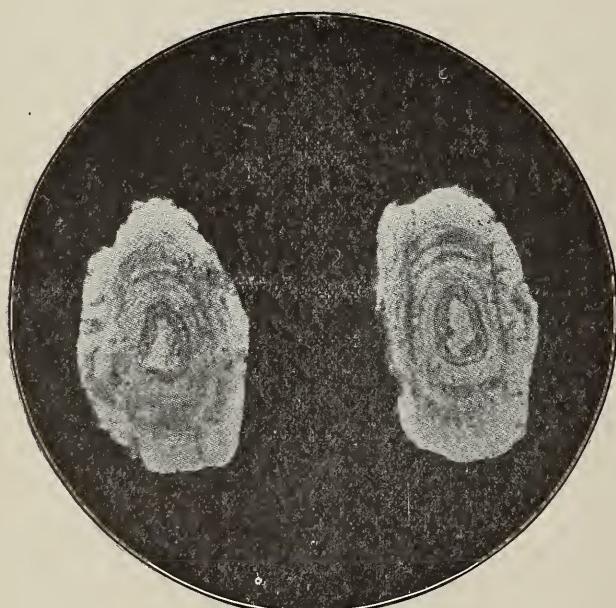


Fig. 4.

Bisected vesical calculus consisting of five different layers—the nucleus and third layer being of calcium carbonate, its branches of calcium oxalate and tri-phosphate, and the outer



Fig. 5. Exposure two minutes,  
medium hard tube.

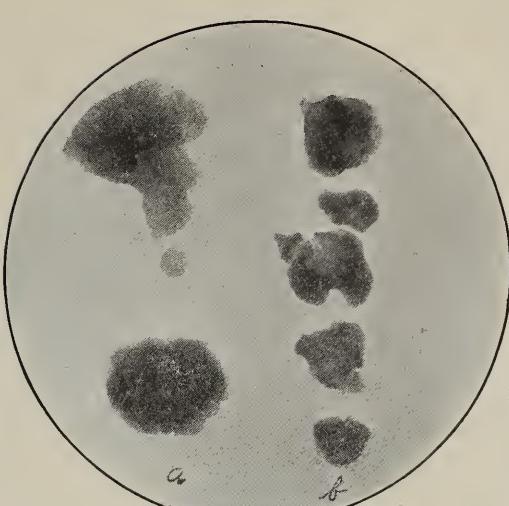


Fig. 6. Exposure two minutes,  
soft tube.



Fig. 7. Exposure three minutes,  
soft tube.

*Figures 5, 6, 7, and 8 show Calculi skiographed with the Author's Diaphragm.*

The disadvantage of the tubular diaphragm is that only small areas can be shown at a time. This disadvantage is little felt in the representation of joints, etc., but in renal or biliary skiography it may be responsible for missing the seat of the calculi.

It is evident, therefore, that in skiography of the urinary tract a general exposure must precede that of a limited area, since it cannot be known before-

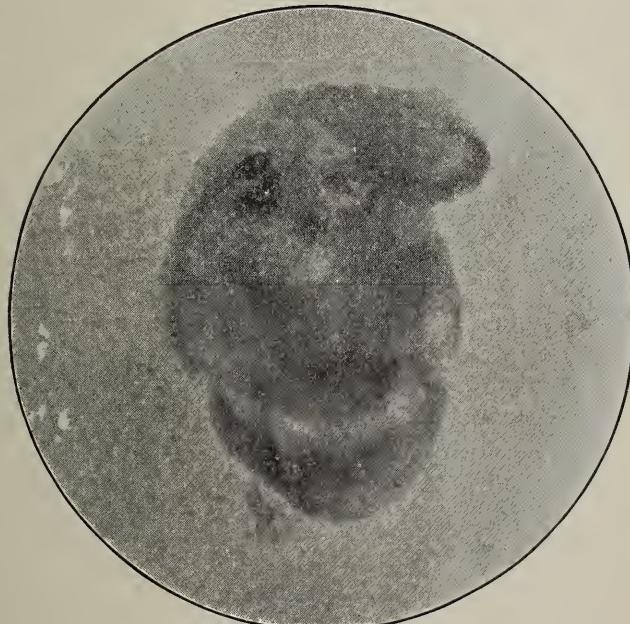


Fig. 9.

Tuberculous focus in the kidney showing calcarous deposits.



Fig. 8. Exposure four minutes, soft tube.

hand whether the suspected calculi are situated in the ureters or in one or both of the kidneys.

Now, if a large plate, including the regions of both kidneys, prove to be negative, although other means of examination point to the presence of nephrolithiasis (hematuria for instance), both renal regions must be separately examined with the aid of the diaphragm, several exposures sometimes being required. This is, of course, troublesome, but in view of the great importance of a correct diagnosis, it cannot be omitted. Rarely, however, does it happen that many ex-

posures are needed. Two, as a rule, suffice for our information.

In this manner I have been able to show even the indications of calcareous deposits produced by renal tuberculosis (Fig. 9).

Some of the results obtained by the aid of the tubular diaphragms are shown by skiagraphs Nos. 11 and 12, which illustrate two cases of nephrolithiasis, in which the calculi were studied before and after nephrotomy. In the first case the general exposure on a plate of the size of  $11 \times 14$  inches revealed the faint outlines of four calculi on the right side. They could be well recognized on the photographic plate but would show poorly in a reproduction, while Fig. 11, taken with the aid of the diaphragm, shows the four calculi distinctly.

In the second case the general exposure revealed the renal stones well. At the same time a large vesical calculus was discovered. The diaphragmatic exposure, Fig. 12, illustrates the nephrolithiasis most markedly.

In both cases I had the opportunity of performing a successful nephrotomy, which enabled me to study the extracted calculi with reference to their composition and their degrees of density. At the same time I could represent the difference between the ordinary and the diaphragmatic exposure, as well as the influence of the various degrees of tubal vacuum and time of exposure.

The calculi removed in these two cases proved to consist of oxalate of lime. They show layers of various thickness. Figs. 1, 2, and 3, were taken in the ordinary way. Fig. 1 with a tube of moderate hardness, Figs. 2 and 3 with a soft tube. The exposure in Figs. 1 and 2 lasted three minutes and in Fig. 3 four.

Figs. 5-8 were taken with the aid of my diaphragm, Fig. 5 with a tube of medium hardness. Figs. 6, 7, and 8 with a soft tube. The exposures in Figs. 5 and 6 lasted two minutes, in Fig. 7, three, and in Fig. 8, four minutes.

These results also prove, that with the aid of the diaphragm the skiagraphs appear much more marked than by an ordinary exposure. They demonstrate further, that a soft tube gives the best contrasts and that there is no essential difference between a two-minute and a four-minute exposure. Of course, the structures of the calculi show better in Fig. 8, which is exposed four minutes, than in Fig. 6, which is exposed two minutes only. But the important points are demonstrated in Fig. 6 as well as in Fig. 8.

A far more important factor is the size of the diaphragm. The smaller the diameter, the greater the distinctness of the area, — the greater also, of course, the trouble for the operator. The calculus illustrated by Fig. 10b, for

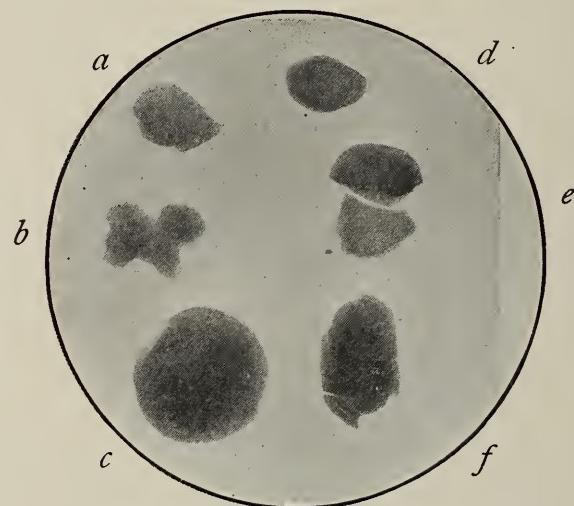


Fig. 10.

(a) Ureteral Calculus (uric acid) with a nucleus of calcium carbonate.

(b) Renal calculus (oxalate of lime).

(c) Vesical calculus with a nucleus of oxalate of lime and an outer layer of carbonate of magnesium.

(d) Renal calculus passed spontaneously (nucleus of phosphate of lime, outer layer of carbonate of magnesium and ammonium).

(e) Vesical calculus (small outer layer of carbonate of magnesium, large inner layer of phosphate of lime).

(f) Vesical calculus (large inner layer of oxalate of lime, outer layer of carbonate of magnesium).

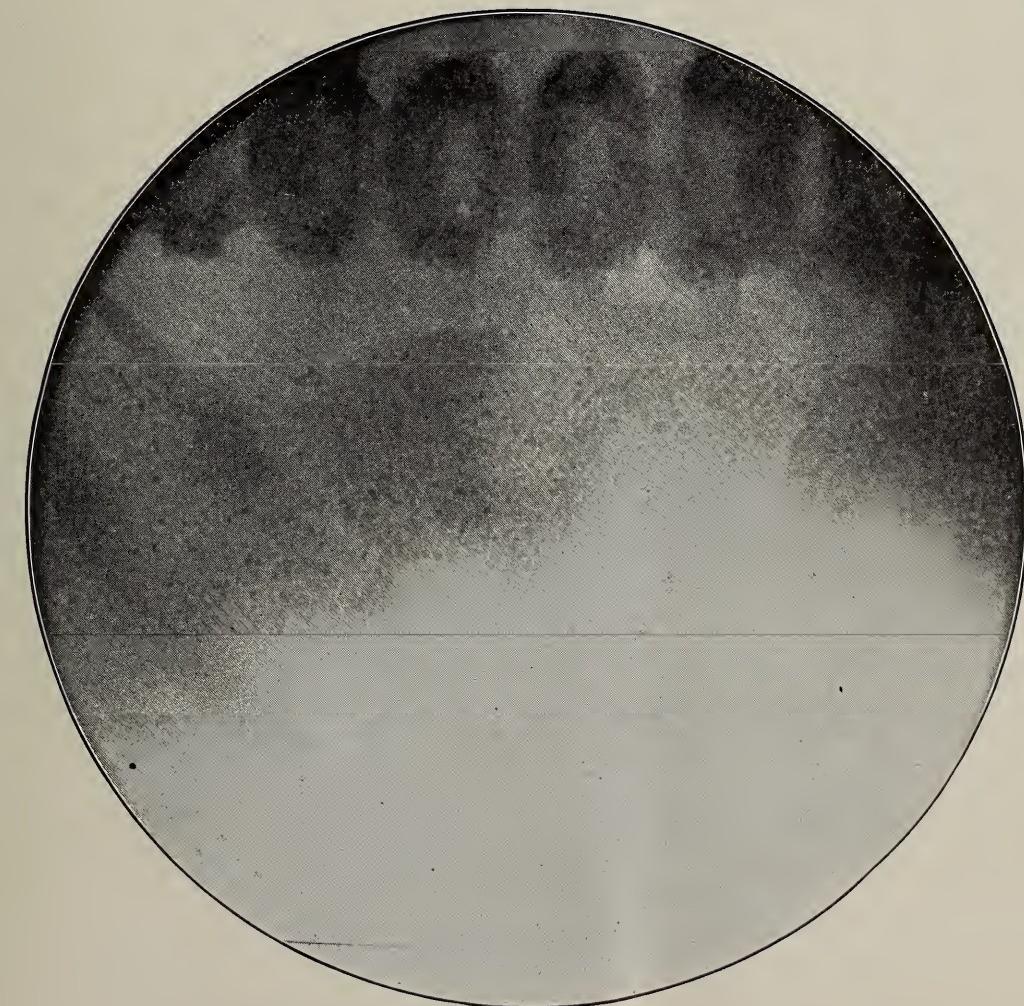


Fig. 11.  
Renal calculi (oxalate of lime), taken by the aid of the Author's  
Diaphragm.

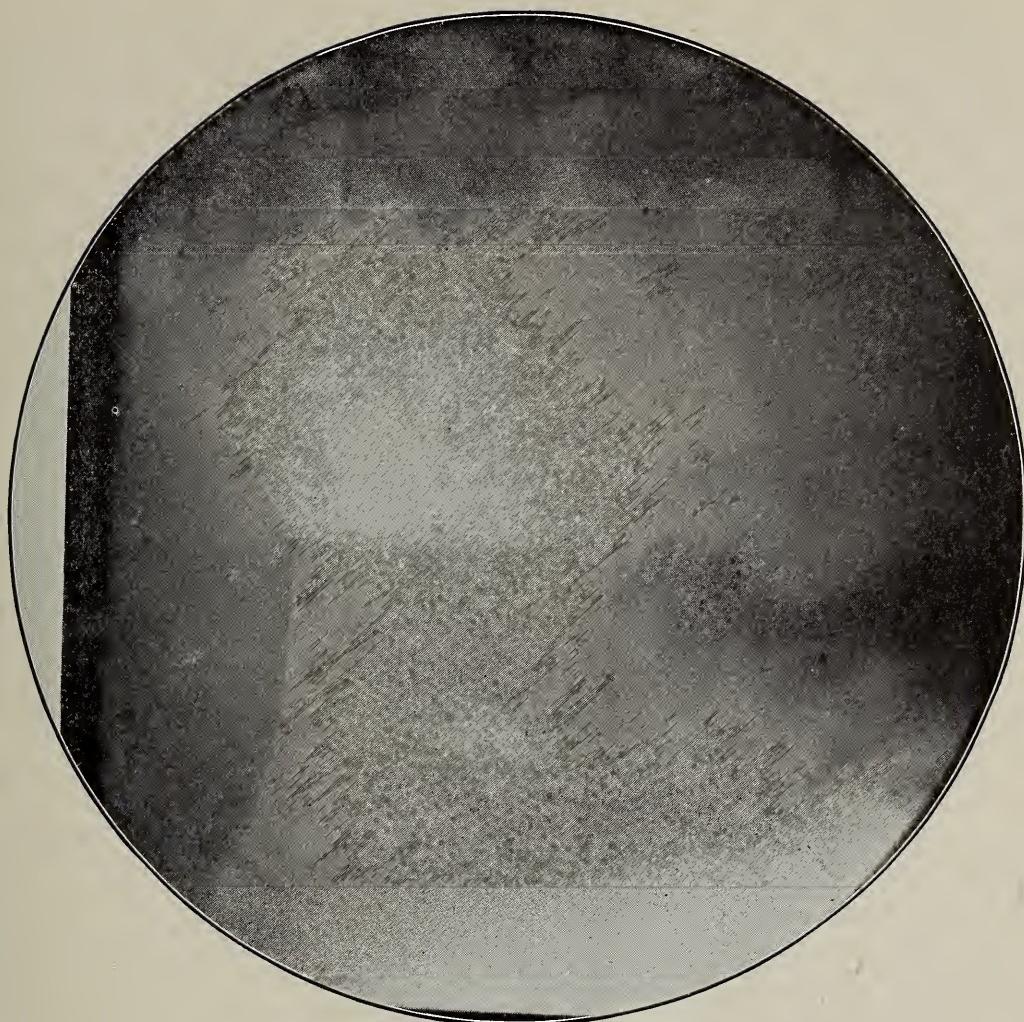


Fig. 12.  
Renal Calculi (oxalate of lime).  
*Illustrating—Experimental Studies on the Density of Calculi of the  
Urinary Tract—Beck.*

## THE DENSITY OF CALCULI



Fig. 13.

Calculus exposed in the kidney (photograph). instance, taken by the aid of the large diaphragm which has a diameter of five inches, does not show as marked as it did when enveloped by the renal substance with the small diaphragm, which has a width of  $3\frac{1}{2}$  inches only (Fig. 14). The same applies to Fig 15, which illustrates an elliptical vesical calculus, consisting of three different layers; *viz.*, carbonate of magnesium as the outer layer, the triphosphate as the main and inner layer, and calcium carbonate as a small nucleus.

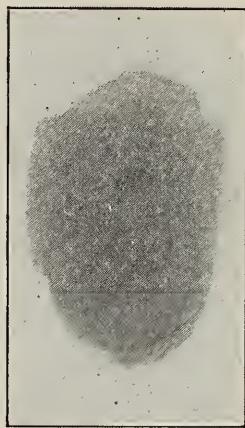


Fig. 15.

Vesical Calculus showing various strata (compare Fig. 10 f).

My statistics show that the oxalate of lime calculi represented the most frequent type in nephrolithiasis and caused more suffering than the other varieties, a fact which indicates that relief by nephrotomy is more frequently required in this type than in any other.



Fig. 14.

Calculus embedded in renal tissue (see Fig. 13), skiagraphed with small diaphragm (see Fig. 10b).

The uric acid calculi cause little suffering as a rule, and are often expelled by the natural passages when treated medicinally, so that operative interference should only be resorted to in exceptional cases.

Similar views apply to the reproduction of biliary calculi. Of course, skiaigraphy of biliary calculi is as yet an imperfect method, cholesterine products mixed with bilirubin or calcium phosphate or carbonate, being the most favorable objects. While a negative result in the case of suspected calculi in the urinary tract can be taken as a positive evidence of their absence, provided the technique was blameless, the same cannot be said of biliary calculi. On the other hand, even a faint skiagraphic reproduction of biliary calculi proves their presence to the expert reader, and renders exploratory laparotomy for suspected cholelithiasis unnecessary.

As I have often insisted, the reason why so many surgeons have tried in vain to represent biliary calculi, is that instead

of selecting soft tubes they use those of greater or lesser hardness, the light of which penetrates the calculi, irradiates them away, so to speak. In all my successful exposures, made with soft tubes, the bones appear dark and indistinct therefore, and especially show no textural details.

One of the main obstacles, the diffusion of the rays in the liver tissue, can be overcome by the use of the diaphragm attached in the oblique direction.

The theoretical objection of some au-

thors, that the bile surrounding the gallstones obscures the shadow, is practically untenable because in by far the greater number of cases of cholelithiasis most of the bile has become absorbed.

As to differentiation between biliary and renal calculi it may be said, that the form of the latter is so characteristic that no mistake is possible. In most renal calculi there will be found present one or more spur-formations indicating a continuation of the substance of the calculus into the ureter.

## THE COMPRESS—A VERY USEFUL BUT SOMEWHAT NEGLECTED HYDROTHERAPEUTIC MEASURE

BY ROBERT E. PECK, M.D., OF NEW HAVEN, CONNECTICUT  
*Instructor in Neurology at Yale*

**T**HE excuse for presenting this paper on so old and well-known a subject is a desire, on the part of the author, to encourage the use of hydrotherapeutic measures in daily practice. The beneficial results accomplished by both these and more vigorous methods of procedure in my hands during the past half dozen years, since I became interested in this class of work, have been very gratifying. There is a constantly increasing tendency, in the present day, towards the use of so-called physiologic remedies in the treatment of diseased conditions, and hydrotherapy holds no small place in this field of therapeutics. The best results are to be obtained at some well-equipped institution where the more vigorous procedures, such as needle baths, movable-fan douche, Scotch douche, Charcot douche, etc., can be administered with modern apparatus for the careful regulation of temperature and pressure, but there are many simpler forms of treatment which can be applied at the patient's own home, either by the

patient alone or with the aid of a very little assistance from an attendant, and from which a great deal of benefit can be derived.

The different forms of the wet compress which I wish to describe are: (1), the abdominal compress or bandage or Neptune girdle as it is sometimes called; (2), the combination compress devised by Winternitz; (3), the precordial compress; (4), the stimulating chest bandage or crossbinder (Kreuzband) of Winternitz; (5), the hot chest compress or steam compress of Buxbaum; (6), the wet trunk pack or compress; and (7), the wet circular bandage compresses. Besides these there are in common use other forms of wet compresses or bandages, namely, the throat compress, the sural or calf compress, head, hemorrhoidal, genital compresses, etc.

### THE ABDOMINAL COMPRESS.

The wet abdominal compress or bandage is one of the most useful of the minor hydriatic procedures. Besides the decided beneficial results following its use, it recommends itself to every practitioner because of its sim-

## THE COMPRESS



Fig. I. Abdominal Compress or bandage.

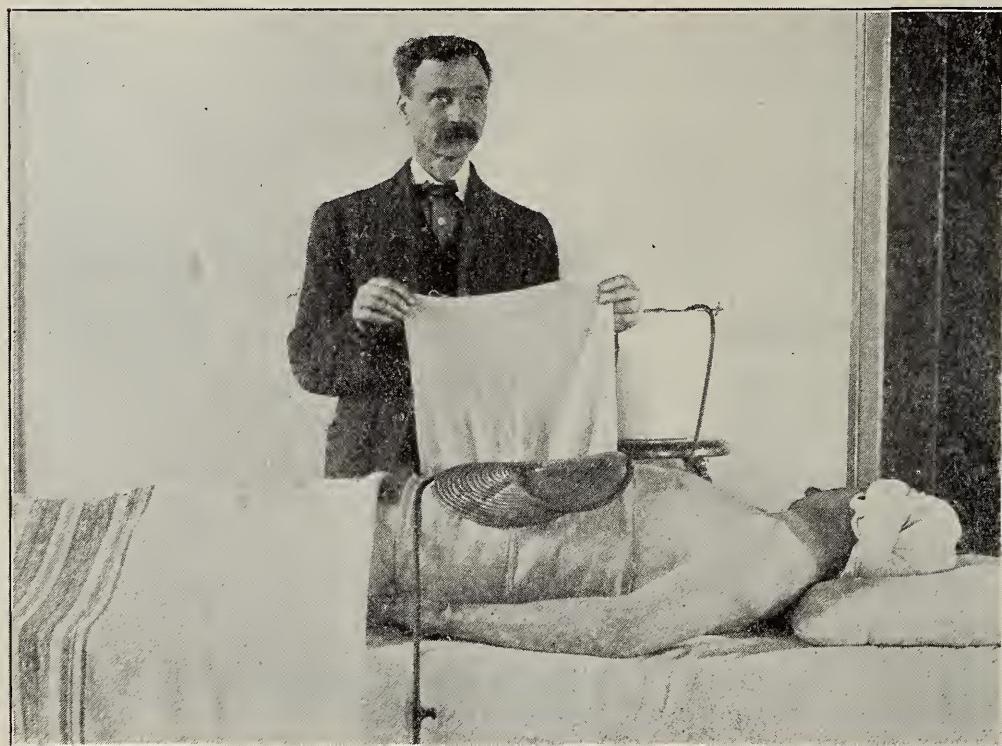


Fig. II. Combination Compress of Winternitz.

plicity and ease of application. A great many hydriatic procedures require either the use of expensive apparatus or the assistance of an attendant, but the abdominal binder can be applied by the patient himself, and its use is almost always attended by beneficial results.

For its application one needs a coarse piece of linen of sufficient width to reach from the ensiform cartilage to the symphysis pubis and long enough to pass around the body and overlap in front, so that the abdomen is covered by a double thickness. This is wrung out of water at 60° F., and covered with a dry flannel bandage a little wider than the wet piece, so as to reach beyond its top and bottom and thus prevent the access of air and a consequent chilling of the skin. Both pieces are to be drawn up snug and securely fastened.

#### THE COMBINATION COMPRESS.

The combination compress of Winternitz is a modification of the abdominal compress and is useful in obstinate vomiting, organic and functional gastric catarrh, cardialgia, flatulence, eructations, and insufficiency of the stomach, hyperacidity, ulcer of the stomach, also in dysmenorrhœa. This compress consists of the abdominal compress applied in the usual way, with a Leiter or rubber coil laid over the epigastric region and water at a temperature of 120° F. to 130° F. is made to flow through the coil. In anorexia, so common in phthisis and other wasting diseases, it is highly recommended. Of its use for the relief of these symptoms Winternitz\* writes as follows: "Of all the indications named, that which is most successfully met, is, in our experience, obstinate vomiting. The patient gradually becomes able, under the influence of the compress, to take milk as well as other readily-digestible food, and finally more solid nourishment. The patient is laid within the

compress and water permitted to flow through the coil. After the lapse of perhaps a quarter of an hour an attempt is made to administer nourishment, and then warm water is made to flow through the coil for at least a quarter of an hour, the patient being permitted to lie in the compress for a further quarter of an hour without running water."

#### THE PRECORDIAL COMPRESS.

The precordial compress will be found a very useful form of procedure in treating cases of arythmia, functional acceleration of the pulse, cardiac neuroses, and in valvular diseases, if not too severe, also in diseases of the myocardium when of slight degree. Care should be exercised however in applying too cold compresses in severe organic diseases of the heart lest the organ might be paralyzed instead of stimulated and arrested in dyastole. The temperature may be reduced gradually in place of using too cold water to start with.

The method of applying this compress is to cover the precordial region with a linen cloth, moistened in cold water, lay the coil over this and cover the whole with dry flannel; then allow cold water to run through the coil. In ordinary cases the duration of the application should not be continued longer than ten or fifteen minutes, but later it may be applied for from one to several hours.

The effect is powerful and almost immediate. The accelerated pulse is slowed, the arythmia corrected, vascular tension increased, and the blood pressure raised. Winternitz regards it as the "hydriatic digitalis." In extreme cases the coil may be kept in place for several days.

Julien\* describes a case of typhoid fever of severe type in which the patient had lost consciousness and lay in a tetanic condition with occasional spasms of the head. The temperature

\* System of Physiologic Therapeutics, Cohen, Vol. IX.

\* Gazzetta delle Cliniche, 1887.

## THE COMPRESS

was  $104^{\circ}$  F., the pulse successively  $120$ ,  $140$ , and  $160$ . He applied the ice coil over the chest as a last resort, watching the pulse constantly, ready for any untoward symptoms. In less than fifteen minutes the frequency of the pulsation began to diminish and their amplitude to increase, and in a short time the almost imperceptible pulse gave way to one of decided elevations of the artery. When he removed the compress the alarming symptoms returned, so he allowed it to remain several days, and when the temperature yielded, the cerebral symptoms disappeared and the patient was out of danger. He attributed the safety of his patient to the employment of this measure. In conclusion he remarks, that the beneficial effects show themselves in fifteen or twenty minutes and reach the maximum in about an hour. He admits that the effects are transitory, but says there is no harm in continuing the application as long as the patient is in a precarious condition.

### THE STIMULATING CHEST BANDAGE.

The stimulating chest bandage or crossbinder, consists of a linen bandage one and one half to three yards long and six to fifteen inches wide. This is rolled up and wet in water at  $60^{\circ}$  F., and applied to the chest in the following manner:

Beginning at the right axilla pass the bandage over the left shoulder and across the back to the point of origin. It is now brought forward across the front of the chest to the left axilla, and finally transversely across the back and over the right shoulder, terminating on the front of the chest. The second (dry) bandage is applied in the same manner as the wet one, and should accurately cover the latter at every point. The ends are securely fastened by pieces of tape and the whole thing is held in place by a woolen shirt.

This form of compress is used in diseases of the chest, diminishing the cough

and dyspnœa and softening the thick viscid secretion, and in diseases of the pleura favoring the absorption of the exudate. Baruch\* recommends it very strongly in the treatment of pneumonia, using instead of the crossbinder of Winternitz, a jacket made to fit the chest, front and back, with pieces over the shoulders after the manner familiarly known as the oil-silk jacket. Two jackets of this sort, each of linen and of closely-woven flannel, should be provided, so as to facilitate changing. The flannel ones should be an inch wider than the linen. He has one of the linen bandages soaked in water at  $60^{\circ}$  F. and wrung out, not too dry, and applied with as little disturbance of the patient as possible. The flannel jacket should be made to fit accurately and drawn up snug. Baruch recommends changing the compress every half-hour when the temperature is above  $102^{\circ}$  F., and every hour below this point until it reaches below  $99.5^{\circ}$  F. when it should be discontinued. This bandage can be applied and changed without disturbing the patient very much.

### THE HOT CHEST COMPRESS.

The hot chest compress or the steam compress of Buxbaum, consists of a layer of dry flannel over which is placed a very hot compress, and this in turn is covered by another piece of dry flannel. It is applied to portions of the chest to promote the absorption of the viscid exudate in chronic inflammations, and in intercostal neuralgia.

### THE WET TRUNK PACK.

The abdominal binder may be increased in size so as to cover the entire trunk, in which form it is known as the *trunk pack or compress*. It is used principally for its anti-pyretic effects, especially in children and in inflammatory disorders of the abdominal and pelvic organs.

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\* Hydrotherapy.

## THE WET CIRCULAR BANDAGE.

The wet circular bandage compresses have been used by Baruch \* in the treatment of acute articular affections. They consist of roller bandages of old linen, from a half to one yard long and two to four inches wide, wrung out of water at 60° F. and applied to the joint; these in turn are covered with flannel bandages. The compresses should be changed hourly.

Baruch uses these circular bandage compresses in conjunction with large doses of salicylates. Hot circular compresses are used in the treatment of indolent ulcers and may be applied for several days in succession with good results.

## THE RATIONALE OF THE COLD COMPRESS.

When the cold wet bandage or compress is applied, the first effect is to contract the cutaneous vessels and the surface becomes cold. This is soon followed by an active hyperaemia, depending, as regards degree, upon the temperature of the water (the colder the water the greater the reaction), and the reactive capacity of the individual. This primary contraction and subsequent dilatation, with increased activity of the circulation in the surface vessels, is participated in by the underlying vascular area, which is connected with the skin by reflex action. The skin underneath the compress becomes warmed and in turn the compress itself is warmed and dried by reason of the slow evaporation taking place from the surface. As with other cold procedures the deeper-lying vessels become dilated and the blood flows more rapidly.

In addition to the effect upon the circulation, the peripheral nerves are irritated by cold, and this and the subsequent calming effect brought about by the warming of the part, is communicated to the central nervous system and

reflected along the efferent nerves to other related parts.

With the combination compress, the warming effect which follows the cooling of the skin is hastened underneath the coil, and as a result the epigastrium is soon bathed in warm vapor; the calming effect is thus heightened and readily transmitted to the underlying parts.

The effects upon the composition of the blood, as studied by Winternitz,\* are both interesting and instructive. According to his observations, the local action of cold causes an increase in the cellular elements of the blood, in the percentage of hemoglobin and in the specific gravity at the point of application, and a diminution in parts remote from this region.

A determination of the composition of the blood from the finger tip and from the abdominal wall was made, then a stimulating or cold compress, well surrounded by dry covering, was applied, and after an hour had elapsed another determination was made. There was a marked reduction in cellular elements in the blood from the finger tip. On the other hand there was a decided increase of the erythrocytes, hemoglobin and specific gravity of the blood from parts covered by the compress; an increase that in some cases equaled 2,000,000 erythrocytes and more than 120 per cent. of hemoglobin as shown by Fleischel's apparatus.

Winternitz has demonstrated that there is an increase in hemoglobin, in the number of erythrocytes and in the specific gravity of the blood after thermic procedures, as we go from the periphery towards the center of the body, *i.e.*, the blood from the finger tip was less rich in red cells and in hemoglobin than that from the abdominal wall. The leucocytes do not obey this rule; they are sometimes increased at the

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\* Hydrotherapy.

periphery and sometimes at the central portion.

The effects of warm compresses are quite different, as is shown by the following results: The blood from the finger tip showed, hemoglobin 95%, red cells 5,300,000, leucocytes 7,000, while from the abdominal wall the results were, hemoglobin 120%, red cells 7,000,000, leucocytes 7,000, before the application of the warm compress. After the warm compress had been in place for one and one-half hours over the abdomen, the hemoglobin of the blood from the finger tip had increased 10%, the red cells 900,000, the leucocytes 1,000. On the other hand the blood from the skin of the abdominal wall underneath the compress, had lost 22% of hemoglobin, and 2,500,000 red cells, and the leucocytes had doubled.

This decided difference between the effects of cold, stimulating, and warm compresses should be borne in mind when deciding upon the actual requirements of our cases. The former produces congestion, fluxion, and erythrocytosis, while the latter produces active leucocytosis and diminution of red cells. For anti-phlogistic purposes during the early stages, when there is active inflammation, the skin is turgid, and the circulation open, cold applications are indicated, but when the parts have become blue and cyanotic and the leucocytes have begun to adhere to the vessel walls and to emigrate into the adjacent parts, warm applications should be used. Cold diminishes the congestion, retards leucocytosis and the emigration of the white cells, while warm applications have the contrary effect and hasten suppuration, when it is unavoidable.

When used for its anti-phlogistic action, the cold compress consists of two layers of old linen which are dipped in water not above 60° F. The cold application causes a contraction of the vessels and slows the circulation — which was previously accelerated — the part becom-

ing anaemic. These effects are produced by frequently renewing the application, because if the temperature is allowed to increase beyond 75° F. then the vessels, which have been contracted, become dilated and the anti-phlogistic effects are inhibited. The lowered temperature must be maintained then, by frequent renewals and by not covering the wet compress.

Care should be taken not to prolong the application of too cold (40° or 50° F.) compresses, and not to be intermittent with the changes, as this would paralyze the vessel walls and lead to a condition of hyperaemia, thereby destroying the effects desired. Baruch,\* in speaking of the remote effects of lowering the temperature of the parts by cold applications, says: "Contrary to the commonly-prevalent idea, that the cooling applications made to the cutaneous surfaces penetrate deeply if sufficiently cold and prolonged, the author is convinced that the heat-regulating machinery of the body is immediately called into action for the purpose of resisting the invasion of the cold into the interior, and that it thus frustrates the object in view. The application of ice-bags in pneumonia, pericarditis, peritonitis, gastritis, appendicitis, etc., is so universal that the author opposes the practice with great hesitance and reluctance. Due consideration of the experimental and practical data bearing upon this subject, however, may convince the reader, as it has convinced the author, of the fallacy of the established practice. The action of cold on the temperature has been fully set forth on page 78, and therefore need not be reiterated. In connection with and in support of this physiological proof the excellent experiments of Dr. W. Gilman Thompson† may be of interest. Dr. Thompson etherized several dogs; shaved the abdominal wall, and made a small incision on one side of

\* Hydrotherapy.

† "International Clinics," 1892.

the latter, through which a long-stemmed thermometer was passed to the opposite side of the abdomen. When the thermometer was felt pressed up beneath the skin an ice-cap was applied for an hour. So long as the dog's circulation was maintained, the thermometer remained uninfluenced, but as soon as the dog was killed the temperature of the abdominal cavity began to fall very rapidly. Heat applied by poultices showed a corresponding behavior. In a cadaver with an abdominal wall not over one-half or three-quarters of an inch thick the cold of an ice-coil penetrated very slowly, but finally, after three quarters of an hour, it caused a diminution of intra-abdominal temperature of  $25^{\circ}$  F. Hence, so long as the circulation is fairly good, it appears to be impossible to influence materially the deep-seated vessels by external local contrasts of temperature; certainly it is impossible to control hemorrhage by these means, and, practically, Dr. Thompson has never seen any benefit from such attempts. If any result ensues it must come through very circuitous reflex action."

Of all the different forms of wet compresses, the abdominal binder or girdle will be found to meet a greater variety of needs. Among some of the conditions in which its use will be found beneficial, are nervous dyspepsia, chronic gastric catarrh, acute gastric catarrh, ulcer of the stomach, dilatation and atony of the stomach, atony of the intestines, mucous enteritis and chronic constipation. The results obtained by the use of the abdominal binder can be varied somewhat by the amount of water left in the bandage and the thickness of the dry covering, also by increasing or diminishing its size.

If the effect desired is a stimulating or tonic one, as in the treatment of gastric or intestinal torpor with dilatation of the stomach, and in chronic constipation, then the bandage should be wrung out quite dry and covered with one layer of thick flannel, as for instance, a piece of

an old flannel blanket. If the desire is to produce decided revulsion of blood to the abdominal walls and the viscera it contains, as in obstinate cases of insomnia, then more water should be left in the bandage and the covering should be of thicker material, or additional layers should be used, or even some impervious material, as a piece of rubber sheet, may be employed instead of the flannel. It will seldom be found necessary or advisable to use this impervious covering however.

Upon the size of the bandage also depend its effects. It may be increased so as to envelop the whole trunk, as in the trunk compress or trunk pack — for its anti-pyretic effects — or it may be made to cover only the lower part of the trunk, as the Neptune girdle, for intestinal or pelvic disorders. When the desire is to influence the arterial circulation of the stomach the bandage should be large enough to cover the lower third of the sternum, the cartilages of the lower ribs, and the space between them and the umbilicus. The importance of this will readily be seen by reference to the anatomy of the parts. The arteries of the stomach are in relation, by anastomosis, with the œsophageal arteries, and also with the internal mammary through the phrenic. The bandage may be left off from the back and applied only to the front of the abdomen, as in the instance when it is used continuously following the Brand bath to reduce the temperature in the treatment of typhoid fever, or if it is desired to influence the venous circulation of the stomach and intestines or kidneys, the application should be made to the sides and back.

One should always bear in mind the fact that if the bandage is allowed to become dry it will act as an irritant, and it should therefore be renewed once during the night if it begins to feel uncomfortable. In the majority of instances it is necessary to wear the abdominal bandage only at night; it should be removed upon

arising in the morning and, after bathing the parts with cold water and applying friction, the patient should wear a dry woolen binder during the day.

When the compress is first applied a slight chilliness is produced; this passes off directly and a sense of well-being follows. If the chilling is unduly prolonged or the patient fails to react at all, the bandage may be dipped in colder water or the parts bathed in cold water just before the application. Winternitz points out the interesting fact that reaction under the wet abdominal compress takes place more slowly when acute dyspepsia is present.

I wish particularly to emphasize the use of the wet abdominal bandage in the treatment of insomnia. Here, oftentimes, this simple procedure gives the desired relief when other remedies have failed. The application should be made as cold as possible, the compress not wrung out too dry and well covered by one or more thicknesses of dry flannel. This primary cold, followed by the heating effect of continuing the compress, insures the diversion of larger quantities of blood into the skin and underlying tis-

sues, as well as into the portal circulation, and leads to the contraction of the cerebral vessels and the accumulation of lymph underneath the dura; conditions which favor sleep.\* The heating protected compress should be avoided wherever there is inflammation of the stomach and bowels, intestinal catarrh, hemorrhage from the uterus and in acute inflammation or congestion of the pelvic organs. The importance of this will be readily recognized when we recall that the effect of the heating compress is to cause the accumulation of blood in the skin and underlying tissues, and into reflexly-related organs.

Sometimes chronic invalids become addicted to the use of the wet abdominal binder. This practice is to be deprecated.

Great care should be taken of the wet bandage to prevent it causing an eczematous or an herpetic eruption, which sometimes occurs and is a very distressing condition. The linen bandage should be boiled daily or rinsed in a 10% solution of chloride of lime or sulphate of zinc, or in a 1/1000 solution of mercuric chloride.

## THE PRESENT STATUS OF RADIOTHERAPY †

BY GORDON G. BURDICK, M.D., OF CHICAGO, ILLINOIS

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**I**T seems to me that the time is ripe when Roentgen ray operators should take some stand regarding the value of this force in therapeutics. It seems to be a fact that nearly all of the articles on radiotherapy appearing in medical

journals are written by men who are not known in X-ray circles, and a great deal of harm has been accomplished in the general practitioner's mind at the present time, by reason of the amount of misinformation that these men disseminate through the channels of medical thought. It is time, if workers in this line wish to save radiotherapy from its friends, to take a decided stand regarding the known value of the ray in the management of disease. There is no

\* Richardson, American Medicine, April 15, 1903.

† Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Md., September 28-30, 1905.

longer any question regarding its value in many classes of skin disease, and it may be considered a specific in all forms of acne, lupus, eczema, psoriasis, pruritus, tinea and sycosis, mycosis fungoides, senile keratosis, venereal condylomata, and hyperidrosis. Of the class of diseases noted, thousands of cases have been treated, and by different men, with unusual success.

Therefore, it is time that the members of this Society let the profession know in no uncertain terms what we can do with a class of diseases with which they can do nothing. I respect conservatism in the medical profession as much as any man, but is it conservatism to tell a patient suffering from some disgusting skin lesion that it is considered incurable, and give him or her some ointment as a placebo, when there are hundreds of men in the profession who know that a sure treatment exists that will relieve these sufferers? I have had over fifty cases that presented themselves to my laboratory during the last year, against the advice and orders of some of the most noted men in the medical profession. These poor sufferers were told by these men that the X-ray "would not nor ever did cure any disease"; that it was being exploited by quacks and "grafters" in the medical profession. X-ray operators might feel hurt about these insinuations if it was not a public fact that some of the "eminent" men expressing this opinion had been caught red-handed in offers to divide fees in order to increase business.

I have found that a persistent attempt has been made in some quarters to misrepresent the value of the X-ray, and it has been successful, owing to the fact that Roentgen ray operators have been very reluctant to commit themselves upon any topic. It is admittedly hard to write upon this subject, as it is almost impossible to tell the whole truth about radiotherapy without discrediting both

the writer and the article in the medical mind. All operators have seen things happen in their laboratories that pass all of their former medical beliefs. It seems incredible to see a case, from fifteen to twenty years a sufferer from some disgusting skin lesion, with prescriptions in their pockets from many of the most eminent men in the profession throughout the civilized world, traveling everywhere, consulting everyone, and being honestly told that their cases were incurable, after being a few weeks under this mysterious radiation, slowly but surely make a complete recovery. If we have difficulty in crediting our senses, how much more incredible must it seem to the general practitioner who has not seen the transformation take place? For these reasons I believe the time has come when some attempt should be made by all Roentgen ray operators to educate the profession regarding the real value of the ray.

There is a class of skin diseases that might be classed, for radiotherapeutic purposes, as "erratic"; in other words, some improve, some are cured, and some do not respond to Roentgen radiation in the slightest degree. Among the number that may be classed under this head are lupus erythematosus, pigmented and vascular nevi, hypertrichosis, and acne rosacea. Of this category, the first two have offered the most difficulty, and while it seems that from a theoretical standpoint lupus erythematosus should respond to the X-ray, in practice it has been found that only about 18 per cent. are cured by the ray, while about 30 per cent. are improved, and the rest are not affected in the slightest degree, requiring other methods of treatment to bring about a favorable result, as the various modifications of the Finsen light and the high frequency currents.

Pigmented and vascular nevi have improved under X-radiation to a marked degree, and in many cases have

## PRESENT STATUS OF RADIOTHERAPY

bleached out to such an extent that for all practical purposes a cure may be said to have taken place.

Hypertrichosis, or superfluous hair, has, on the whole, proved disappointing, as the use of the ray must be carried to the point of vesiculation in order to insure the complete disappearance of the hair. I have had a number of cases where a complete disappearance has taken place, but the treatment is fraught with so much danger of scarring the face that under ordinary conditions it is not justified.

Epithelioma (rodent ulcer), when it exists in the skin alone, will yield readily to X-radiation and exhibit better therapeutic results than can be obtained by any other form of treatment. I now have over 80 cases that have been treated over three years, with no return of the disease or any metastatic trouble; where it involves the lip or the deep structures of the nose or the orbit, extreme difficulty is experienced with any method of treatment, and while a few get well readily, the great majority undergo a slow improvement but stop short of a full cure. With a lip epithelioma, or one affecting the penis, it is well to have the glands removed after a period of quiescence has been brought about by means of the ray. This method has been followed in 23 cases, and with success, as no recurrence has followed the operation for two years.

I want to impress upon you that the X-ray alone is sufficient in the great majority of these cases, and should invariably be used to the exclusion of the knife, except in such cases as appeal to the operator as favorably situated for a radical removal, without complicating the subsequent recovery by cicatricial bands and œdema from lack of drainage.

I have noticed particularly in my own practice that where the characteristic cancer odor is present, as a general rule, it will not be the most favorable

case for X-ray treatment, or for that matter any other treatment. When a case of this kind presents itself, I invariably anesthetize the surface and by means of the galvanic current drive into the tissue for a prolonged time the zinc and mercury ions, causing an extensive slough to take place, and follow the separation of this necrotic tissue by X-radiation; this procedure generally produces a successful result.

I have noticed a peculiar condition of medical thought regarding this class of diseases among surgeons during the last year, a tendency to submit the patient to a partial operation and depend upon the use of the X-ray to do the rest of the work. A case in point presented itself within the last month, of a physician who had an epithelioma of the penis, with a very contracted prepuce. After consulting various surgeons in different cities he was induced to submit to an operation by one of our eminent brothers who advised him that the X-ray would cure his penis, but would not affect the glands in the groin. He removed the glands, although Poupart's ligament and the surrounding tissues were undoubtedly infected and it should have been evident to any observer that it was an anatomical impossibility to completely remove the infection; still the operation was done, and a strange feature consisted of his refusal to circumcise the patient, under the theory that it would not heal up. He could see no danger in the lack of drainage under the prepuce and the possibility of mixed infection taking place, leaving the patient in a many times worse condition than he was before he operated.

It might be of interest to state that this patient was circumcised by an X-ray operator, and that the wound healed promptly.

These cases should be classified in such a way that the general practitioner could be informed as to which cases should be sent for operation and which

class of cases should go to the X-ray operator, as nearly all surgeons have an X-ray outfit which is run by the office girl, and they are no longer doing justice with their operations, because they have been forced to acknowledge that the X-ray has become a dangerous competitor. Where an operation is considered necessary it should be as thorough as the surgeon can make it, and the use of the X-ray afterwards should be persistently carried on, in order to deprive any remaining cancer cells of their power of reproduction.

Post-operative radiotherapy has not always proven a success—owing to the shock and depression following the infliction of a serious wound; the body vitality is lowered, and the embryonic cells will grow long before the normal tissue is in a position to resist them. The drainage of the tissue is interfered with by the removal of the glands and the formation of poorly nourished cicatricial tissue, and for this reason responds to the destructive effect of the ray before the proper changes can be brought about.

It seems to me from the acknowledged success that the ray has obtained in this class of diseases that nearly all cases should be rayed before an operation is attempted. I have many cases of primary cancer that have undergone the retrograde process under the ray, until a complete disappearance has taken place, and I have decided for myself that hereafter nearly all cases will be treated in my own laboratory by this method and an operation will rarely be considered.

#### TUBERCULOSIS

In tuberculosis of the tissues, bones and joints, the X-ray has steadily won its way against the most determined opposition from the medical profession. It cannot be said, however, that the treatment is upon an established basis. At least two more years must elapse before

this question can be settled to the satisfaction of the Roentgen operators. We have all seen cases of this kind recover in our laboratories, and have been unable to offer a rational explanation of the phenomenon, but the idea is gaining ground that we have in X-radiation the best and only known form of treatment that has successfully arrested the tubercular process, except rest, which always left a stiff joint. These facts should be made known to all Roentgen operators, in order that they may be given a chance to carry on further experiments during the next year. There have been enough successes achieved to make this a "conservative treatment," and any operator who does not try the method in this class of diseases will not be doing justice to his patients. It should not be necessary, however, to caution all operators not to become so interested in treating the disease that they forget to treat the patient, as in many cases success can be obtained only by careful attention to minute details.

In pulmonary tuberculosis the ray has not given as good results as it promised to do in the beginning. All cases of primary and secondary tuberculosis are improved within certain limits, and in a certain percentage of cases a prompt recovery takes place, but on the whole the great majority of cases fail to maintain their improvement, and at the first unfavorable influence that surrounds them they immediately lose what they have gained, and a succession of these gains and losses takes place until eventually their strength fails them and they die, in spite of all that can be done.

There is a possibility that a modification of our technique may give us better results, as I have found that passing the rays through a grounded aluminum foil, in order to sift out the soft rays, and allow only the hard rays or the electromagnetic pulse to pass, gives us a wonderfully stimulating effect. By revers-

ing the current through the tube for about one hour, in order to platinize the inner walls of it, we produce a tube which gives off soft rays alone, which seem to stimulate granulations better than any other form of the X-ray. Unquestionably the same result could be brought about by sending the ray through a very thin layer of platinum foil if it was possible to obtain some that was thin enough. Considerable experimental work has taught me that we have a new physical condition of the ray brought about every time the ray is passed through an element with a different atomic weight. The atomic weight and the thickness of the layer of the substance will bring about some very remarkable changes in the observed characteristics of the ray. Nearly every element is capable of transforming the ray to a new condition, and extensive observations should be made by many during the coming year in order to further improve our technique, and perhaps we shall yet conquer tuberculosis by this means.

Tuberculosis of the peritoneum and prostate has yielded some most remarkable results, and the ray should be tried in all cases of this character persistently.

#### LEUKEMIA

We have, in the X-ray, an efficient means of relief for this disease, and in a number of cases apparent cures have taken place. It is marvelous to see a tumor filling the entire abdomen disappear steadily under X-radiation, to see the disappearing process arrested by stopping the ray and to witness the resumption as soon as the treatment is resumed; responding to the ray as readily as does mercury to heat. This terrible disease seems to rob the body of its recuperative power, and while the splenic tumor disappears and a general improvement in health takes place, generally death takes place within a year, from general debility. There is a well-

defined suspicion that the treatment should be carried over the entire body, as well as the spleen. This has been done in two cases and a good result brought about. I have had eight cases of this disease, and have had the satisfaction of seeing the splenic tumor disappear in each instance, with a prompt recurrence in two cases, both of which, however, yielded to further radiation; eventually death claimed six of them, leaving the two cases which remained in a satisfactory condition for a period of one year.

#### CARCINOMA

This disease will require at least one year's further investigation before any definite conclusions can be drawn regarding its true place in radiotherapeutics. The principal difficulty seems to be a lack of confidence on the part of X-ray operators. In order to satisfy their consciences, they have been unwilling to deprive any human being of the slightest chance of recovery, and as they did not have complete confidence in their own remedy, they have been sending cases to the surgeon first, with the result that the case, if it returns at all, returns as a post-operative recurrence, the most unfavorable kind of cancer from a radiotherapeutic standpoint.

I have been fortunate during the last three years in getting 18 cases of primary carcinomata that offered every hope. None of these cases would listen to the suggestion of an operation, and many of them would better be dead than have an operation, being young women with a fair future before them. All of these cases were treated actively with the X-ray; all of them are alive; in 14 cases the tumors and glands have completely disappeared; in 4 they did not disappear, but ceased growing. Two of them were submitted to the zinc and mercury cataphoretic process, in order to remove the tumor because of its mental effect. All of these patients were of the better class of people, and the further developments

of their cases are being watched with interest.

From the success that has attended the use of the X-ray in post-operative and inoperable carcinomata, it seems that the time has come when X-ray operators should begin to treat the primary cases with the X-ray, excluding the use of the knife, or at least leaving it the duty of following up the treatment rather than preceding it. Surgery is an acknowledged failure in cancer, at best gives only a short period of respite, and it has been an experimental treatment for many years. Physicians have looked upon it as a way to satisfy the minds of the patient's family that all was done that could be for their loved one.

There is no reason why a treatment that has scored a great number of successes under the most unfavorable conditions should not be tried for at least one year, by all conscientious X-ray operators. It must have some specific action upon this class of cases, or results such as all of us have observed could not possibly have taken place, and we owe it as a duty to humanity to try and find out where the secret is hidden; if we observe the journals we shall see that the surgeon is groping in the dark. In other words, we constantly hear of new operations and new methods of reaching this terrible disease, all calling for more radical surgery. One, a few weeks ago, was calling for the complete removal of the ribs on the affected side. A more absurd procedure could hardly be imagined, and why are these radical measures advocated in the journals and done in the operating room? Because it is a known fact that the surgeon is at sea when it comes to an operation for cancer. At every death after an operation we hear a clarion call to "*send them in earlier*," always *earlier, never early enough!*"

It seems, in the light of these facts and others too horrible to be told, as though criticism of X-ray operators for treating cancer, from surgeons, did not

arise from absolutely pure motives, should be disregarded, and every case of cancer treated by the X-ray for a period of time that will completely settle this question one way or the other. Any method of treatment where only one or two physicians can get results is open to considerable suspicion, and either the personal equation must be considered, or a general lack of knowledge of the subject is abroad, and requires closer association in order that private knowledge may become public property. No progress is made in any line of thought without someone experimenting, and in a disease where death is certain and inevitable, someone must experiment, or no cure will ever be found. Surgery has never pretended to be a cure. It has merely tried to cut off the disease from the body. Therefore, it is not along this line that we should expect to find a desirable method; but unquestionably a cure exists. It remains only for some experimenter to find it. It may be in the physical field, in a chemical production, or, as most of us have hoped, in serum-therapy.

#### SARCOMA

It is in this disease that I have observed some of the most remarkable results that have ever been obtained in radiotherapy. So uniformly successful have I been in arresting the further growth of the disease and, in many cases, causing the complete disappearance of the trouble, that my confidence has grown to the point that I have taken four cases this last year under contract that no charge would be made if the disease was not checked. I won out in all four cases.

In this disease we are badly handicapped by the fact that the general practitioner rarely is able to diagnose a case of sarcoma until sufficient time has elapsed to spread the disease all over the body and, as a usual thing, some inefficient surgical measures have been attempted and given up as soon as the character of the trouble was recognized.

Most X-ray operators have been suffering from too much conscience, and have been content to give X-ray treatment after the experiment has been carried out by the surgeon, and because the X-ray fails him many times in *post-operative* sarcoma he does not feel that confidence so necessary in the treatment of any disease. If he would only remember that surgery has been one prolonged experiment in malignant disease extending over a period of fifteen years, which began by trying to remove the cancer from ing to remove the patient from the can gressed to the point where they are trying to remove the patient from the cancer, operations always more radical and the results never satisfactory, it would be more easy for him to leave this gentleman out of his calculations and push his own treatment conscientiously; then something might be accomplished.

I do not believe that any case of primary sarcoma exists that cannot be markedly benefited by a prolonged mild radiation from an old hard tube, well plated with aluminum, or from a new tube by passing the ray through a layer of aluminum, the thickness depending upon circumstances in each individual case. But *under no circumstances should irritation be produced*. The slow, persistent radiation gradually changes the character of the sarcoma cell, the tumor undergoes either a fatty or a colloid degeneration, and its characteristics will eventually disappear. One remarkable case of this character was where the late Professor Fenger had done a radical operation for a fibrosarcoma upon the leg of a young man. A recurrence took place promptly and was immediately removed, but recurred in the wound, and also appeared in the ischium. Professor Fenger refused to operate, and suggested the X-ray. He began treatments with me, and kept it up for a period of one year, being treated on an average of three times a week. The growth stopped within two weeks after

the ray was used and has made no further advance in the last five years. The tumors are still evident but cause no inconvenience, and he works as a bacteriologist for one of the largest brewery companies in this city. He has had no pain, and if it was not for the stiffness of the muscles due to the extensive operation, he would not know that anything was the matter with him. This case was shown to the members of the Chicago Electro-Medical Society several times during the course of treatment.

Another case of osteo-sarcoma of the shoulder, involving the humerus, scapula, and clavicle, which was under treatment at the same time, is still alive,\* but not in as favorable a condition as the first case quoted. This patient was a physician, who developed a rapidly growing osteo-sarcoma of the shoulder, which attained the size of a man's head in the course of three months. He became alarmed and sought surgical advice, and no surgeon would dare operate owing to the extensive infiltration, and they all told him that he could only live three months. He came to me in despair and asked me what the prospects were for X-ray treatment. After a careful examination I told him frankly that I did not know, that it did not seem to me that anything could do him any good, but that I would give him the treatment if he would care to take it. He came in three times a week, from a town 220 miles away in Indiana, for treatment, and continued to do so for one year. When he began his arm stood off from the shoulder at an angle of 30°, and he was unable to approach the body with it in any position. The pain was so intense that he could not exist without about three grains of morphine a day, and the only way he could sleep was by throwing his arm around the body of his wife. He was exhibited to the members of the Chicago Electro-Medical Society

\* Died Dec. 14, 1905, from pneumonia.

several times during the course of treatment.

The first result of the treatment was the stopping of the pain. It changed from a steady to a paroxysmal character, and gradually ceased, except at certain changes of the weather. The tumor steadily shrank under the ray until he could get his hand close to the body and put it to his mouth, and eventually, after six months, could use it to feed himself. He improved steadily in health, his "cranky" disposition left him, and he became very companionable. He stopped using morphine, except during periods of great atmospheric disturbances; in the course of a year fluctuation was noticed, and upon incision about two quarts of colloid material discharged. He was now in good health, and remained so for two years, when more of the tumor broke down and discharged. No further growth of the tumor has taken place towards the body, although there seems to be a mild action further down the arm, which was protected during the treatment. He began to fail during the last year and gave up his business, and I believe that he will not live many months owing to his general ill-health. The most careful examination has failed to show the growth of any metastasis in the body. The sarcoma has repeatedly broken down and has discharged immense quantities of colloid material, and this drainage has had much to do with his physical weakness.

In this case, while a cure cannot be claimed, at least the growth that existed was checked so that he had at least four years of comfort, and that additional lease of life. He has been one of the most grateful patients I ever treated, and feels that the ray prolonged his life for at least four years.

I can recall a great many cases of primary inoperable sarcoma where the results have far exceeded the one in this case; in many of these cases the tumor has completely disappeared and the pa-

tients have remained in good health for five years.

#### KIDNEY DISEASES

There are many indications that in the ray we shall find an exceedingly useful remedial agent. I have had two cases of Bright's disease that have recovered while the patient was being rayed for an extensive patch of sycosis around the waist-band. The albumin disappeared completely in seven weeks and remained away for three months, when the patients passed out of my knowledge. It was exceedingly gratifying to observe the improvement in the general health of the patients. It would be well if more experiments were made along these lines.

#### FIBROID TUMORS

While raying a case for venereal condylomata, a large fibroid tumor was observed to decrease markedly in size, and further experiments should be made along these lines.

#### GASTRITIS

Several times while treating other diseases I have observed the disappearance of an obstinate gastritis. Further experience may show that the ray exercises some influence upon this trouble.

#### TIC DOULOUREUX

I have tried the ray in four cases of this disease, where it was of long standing, and have been able to remove permanently the paroxysms in three cases. One of the cases was relieved temporarily several times, but persisted in recurring. The technique consisted of a short powerful exposure to the ray, once a week.

#### EPILEPSY

A general improvement has been observed in several cases of this disease while undergoing raying for acne and sycosis. In several cases the improvement was very marked and amounted to practically a suppression of the attacks for several months, indicating a possibility that good results might be obtained with further study.

## PRESENT STATUS OF RADIOTHERAPY

## ELEPHANTIASIS

The effect of the ray upon this disease is remarkable. A steady retrogression takes place, and it is probable that a cure might be brought about if the treatment were persistently carried out. There are many other conditions which have responded favorably to the X-rays, but owing to the length of the paper I will not call attention to them but will devote a few words to the general technique involved.

First, I have endeavored in all cases to regulate the penetration of the ray to the exact depth at which I desired the work to be done.

Second, have selected rays, that are either hard or soft, for use in suitable cases.

The hard rays are obtained from an old tube, well plated with aluminum, or by passing the ray through a grounded screen of this metal.

Soft rays may be obtained from a new tube, low in vacuum. From an old tube, by reversing the current through it for fifteen to thirty minutes, in order to platinize the inner walls of the tube, or by passing the ray through a grounded layer of some metal with a dense atomic weight as lead; or platinum foil of approximately  $1/10,000$  of an inch in thickness, will sift out all of the hard rays and leave the soft.

The hard rays are used where a stimulating action is required, as in ulcers and many deep-seated diseases. They will rarely cause any irritation of the skin.

The soft rays are used to destroy infection; are exceedingly active from a chemical standpoint, and may be sent through the body by regulating the electro-motive force of the apparatus.

I have found by extensive experimenting that the resulting wave of the ray is modified by its passing through metal of all kinds. The atomic weight of the metal and its thickness determine the resulting length of the wave. I have found further that the cells respond in a different manner to the slightest change in the period in which the ray is sent out into space.

I wish to appeal to all physicians who are using the X-ray in therapeutics, to be X-ray operators for a period of one year, in order that we may know by the next meeting the exact value of the ray in disease. I don't mean by this that other means should not be used, but that cases should be treated persistently that are primary in character, and not human wrecks turned out of our operating rooms.

## DISCUSSION

Dr. PRICE (Scranton, Pa.) cited a case of carcinoma of the breast that was complicated by kidney disease. The tumor was rayed three times weekly, tube distance 12 inches, at intervals for nine months. At the end of that time the patient's kidney trouble was gone, and she is still in good health.

Dr. H. H. COOK (Detroit) prefers to ray cases of carcinoma both before and after operation, but in cases of sarcoma he believes that his results have been better when no operation was performed. He cited a case of diabetes which had been pronounced hopeless, and which improved wonderfully under Roentgen ray treatment. Another case of severe burn which became infected with the yeast fungus also improved promptly under the same treatment.

# THE ROENTGEN RAYS AS A FACTOR IN MEDICINE\*

BY ARTHUR HOLDING, M.D., OF ALBANY, NEW YORK

**R**OENTGEN'S discovery is now ten years old and during this time we have come to realize that it is not only a diagnostic agent, but that it also has a physiological action, with indications, contraindications, and therapeutic value. On the skin, attention was early called to the X-ray burns. Their characteristics of latency of development and stubbornness in healing, associated with the histological findings of atrophy of the cells in the skin's appendages and endarteritis obliterans, have later caused these manifestations to be looked upon more as gangrenes than "burns." Corneal ulcers, alopecia, eczema, parchment-like dryness, exfoliation of nails, and pre-epithelial keratoses were also occasionally met with. In cases where extensive areas were involved and that were fortunate enough to heal, there was much soft scar tissue and frequent telangiectasis.

Such calamities practically never occur to the patient today. The only persons seriously endangered are those who are frequently in the rays. The operators themselves have suffered the most. Three have already departed this life after having submitted to repeated amputations of fingers, hands, arms, to and even beyond the shoulders. One surgeon reports a case in which epitheliomata developed on the hands in nine different places, the diagnosis of each lesion being confirmed by competent microscopical examination. Parts of five fingers were amputated, the ulcers excised, and skin grafting done. This required a long course of treatment, but the condition was ultimately controlled.

In my own experience some thirty

operators have been troubled by chronic lesions on their hands, presenting all the stages from the so-called chronic eczema (?) up to lesions requiring amputations of fingers and arms.

## *Effect on Subcutaneous Structures*

Within the past two years attention has been called to the action beneath the skin; particularly on the spleen, lymphatic tissues, bone-marrow, ovaries, testicles, and prostate glands. On all of these the rays exercise a destructive action. In the lower animals this destructive action has been observed after exposures aggregating 195 minutes. Van Allen has reported the examination of 7 cases of men who had been treated with the X-rays for therapeutic purposes; in every case that had received more than 15 treatments over the perineum, he could find no spermatozoa in the spermatic fluid. Some of the cases were examined one year after cessation of treatments and their semen was still sterile. These symptoms are accompanied by no loss of sexual desire. Pusev has demonstrated the destruction of epithelial cells in carcinomata and their substitution by connective tissue cells. Therefore, in the discovery of Roentgen we have an agent with a varied physiological action, and a selective action on the more highly organized glandular cells. The above facts verified by competent observers establish a scientific basis for many of the therapeutic claims made for the X-rays.

It is only a confession of limited experience of faulty technique for any one to deny the at least ameliorating effect of these rays in epidermoids, carcinomata of the breast, spleno-myelogenous leukæmia, pseudo-leukæmia, tubercular adenitis, lupus, psoriasis, pruritus, eczema, acne. Because of the expense

\* Read before the New York Academy of Medicine, October 5, 1905.

and length of treatment the ray is only to be recommended after simpler and quicker methods have failed; in fact, I never recommend it in any case where other therapeutic procedures offer good prognoses.

Its value as a diagnostic agent for bone lesions and foreign bodies needs no mention here; but the value of the X-ray in diagnosis of chest diseases has not received the attention it merits. In several clinics in Europe an X-ray examination of the chest is considered as important as the observation of the physical signs. This will obtain here when the profession realizes the ease and accuracy of the method in competent hands.

While this agent is dangerous, yet it is useful; those who have become proficient with it seem loath to abandon it, as they have spent several of the best years of their lives mastering the intricacies of electricity, photography, and vacuum tubes. The problem that must be solved is that of safety to the operators.

Fluoroscopic examination should never be made. A screen examination with the observer protected from the rays is the only safe procedure in those cases where it is important to watch the excursion of the diaphragm and pulsations of the heart or aorta.

Various protectors have been suggested, some to be worn by the operators, some to be placed on the tubes, and others to be interposed between the tubes and the operators. A metal of high specific gravity must be employed, and lead is the favorite. A lead suit of armor would be too cumbersome and heavy, while the practice of wearing a lead apron is insufficient protection. It will cover the abdomen and pelvis, but with an agent as powerful and dangerous as the X-ray has proven to be, one should not needlessly expose the liver, heart, kidneys, spleen, intestines, brain, blood, and lymphatic systems. If a substance as heavy as lead is used to surround the

tube, it should have the tube-holding support attached to it instead of clamping the tube into the tube-holder and allowing the delicate glass to support all this weight. When the tube is surrounded in this manner the operator cannot judge the character of the rays by the fluorescence of the glass. For this reason experiments are now being made with tubes made of lead glass. The operator must be protected not only from the direct rays, but also from the secondary rays set up whenever the direct rays impinge on other matter.

The switch board and all regulating apparatus should be on the side of the X-ray room farthest removed from the X-ray tube. A lead-covered barrier should surround the operator. Mirrors can be so arranged that the patient, the tube, and the apparatus can be constantly under inspection. The short exposures that the patient is subjected to for skia-graphs probably inflict no material injury on him. When the patient is subjected to therapeutic exposures normal parts of the body must be protected. In conclusion it may not be "out of order" to state that radium is not superior to the X-ray for the therapeutic purposes, but as it is free from connecting electrical wires it can be used in cavities such as the oesophagus, stomach, and bladder where X-rays cannot be applied directly.

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## EDITORIAL

### MILK DIET IN TYPHOID FEVER

ONE of the unfortunate incidental results of the almost universal desire of young physicians and of medical teachers to promote and to assist in the advancement of medical science is that many principles and methods, of undoubted value, which are recognized and employed by one generation of practitioners are overlooked and neglected by the next.

Twenty years ago two important principles in the physiological therapy of typhoid fever seemed to have been definitely established. One of these is absolute rest of both body and mind. The other is the use of milk alone as a food.

Simple as these two principles are, the necessity of being guided by them will surely be questioned, by the patient or his friends, in every case which progresses to convalescence. One of the earliest indications—and a very welcome one—of approaching recovery is the cry of the patient for more food, and for different food. This is quickly followed by his urgent plea to be allowed to sit up and to see his friends.

It is indeed a physician of unusual strength of character, who can listen unmoved to these demands for some relaxation from the rules which have been laid down. It is perfectly natural for him to wonder if his patient cannot have a little more liberal diet without any resulting injury, or if he may not sit up for a short time, or talk with some friend for a few minutes, without delaying his convalescence. It is difficult to resist appeals which seem to be not very unreasonable.

Doubtless sometimes they may be granted without detriment to the patient. But if yielding to his importunities is followed, not infrequently, by a return or an aggravation of unfavorable symptoms, and if it is impracticable to distinguish, in advance, between the cases which will suffer in this way, and those which will not, it is the duty of the physician to err on the side of safety, and to follow the rule which is based on prudence.

It is impossible to overestimate the importance of typhoid fever and its treatment. This disease attacks, with especial frequency, persons in early adult life, when their time is of very great value, and often the most active and the most vigorous. It causes many deaths. When recovery follows, it is usually after a long and severe illness, and a tedious convalescence.

It needs no argument to attempt to prove the proposition that any principle of treatment which tends to prevent death, or to abbreviate the period of illness and convalescence, and which has no unfavorable incidental effect, should be universally recognized, and should be always observed.

On the other hand, if any innovation is proposed, which occasionally tends to increase the liability to death, or which sometimes tends to prolong convalescence, it should be condemned and rejected.

Of late years a number of teachers and writers have advocated a more liberal diet in typhoid fever. It would be impossible for any one individual to prove the desirability of this innovation so conclusively as to lead every one else to accept and adopt it. Nor on the other hand would it be much more easy for any one to prove that the new proposition is absolutely wrong, and should be unqualifiedly condemned.

This is a question which each practitioner must settle for himself, not only as regards the general proposition of limiting his typhoid fever patients to a milk diet, but also as regards the possibility in any individual case of abandoning the milk diet, without running the risk of sacrificing the life of his patient or of prolonging his convalescence.

Each case should be watched, throughout its entire course, with the greatest care. If in any case a deviation from a milk diet is followed by no disturbance of temperature, pulse, stomach, bowels, or any symptom, it may be assumed that it has done no harm. But if, on the other hand, the temperature has increased, the pulse has become weaker or more rapid, vomiting or loss of appetite has followed, or diarrhoea has come on or has been aggravated, it is the duty of the physician to consider very candidly whether these untoward conditions have been due in any particular to the change in the food, and unless he can satisfy himself absolutely that they were not due to this cause, it is his imperative duty to exercise greater caution in making such changes in subsequent cases.

Milk has many advantages as a food for fever patients:

First. Milk requires no mastication, a physiological process which is difficult for the patient, when his mouth has become dry and parched.

Second. The taste of milk, being neither sweet, sour, nor bitter, is not objectionable to most persons.

Third. Milk is easy to swallow, because, on account of its fluidity, it presents no solid mass as an obstacle to deglutition.

Fourth. Milk is more easily digested than any other unprepared food.

Fifth. Milk may generally be obtained, with comparative ease, in a fairly fresh state.

Sixth. The composition of milk, when fresh and undiluted, is not subject to very important variations, but is fairly constant.

Seventh. Milk is composed largely of water, which acts as a solvent of the products of destructive metamorphosis in the body, and aids very materially in their elimination.

Eighth. Milk, when taken in reasonable amounts, does not increase the fever, as many other foods do.

Ninth. Most important of all, milk contains every nutritive principle necessary for the maintenance of life.

A few objections to the use of milk in fever patients have been suggested:

First. To some persons milk is distasteful. This objection may generally be overcome. If no other food or drink is given, and the attendants insist, gently but firmly, upon the taking of milk by the patient, he will generally prove submissive, and take it without much complaint. Sometimes he will even come to like it. It may be given either cool or hot, as the patient may prefer. Sometimes the addition of a small quantity of whisky, brandy, rum, tea, or coffee will enable him to take it with less discomfort. At the same time the physician should exercise caution in adding stimulants or drugs to the milk lest he provoke in his patient a dislike for it, although it may have been taken in its natural state, without complaint.

Second. Milk sometimes forms large tough curds in the stomach. This may often be prevented by dilution with water and the addition of lime water. In other cases it may be necessary to peptonize the milk by the addition of extract of pancreas with bicarbonate of soda dissolved in water.

Third. Milk sometimes ferments in the stomach or intestines. This results in the production of gas and other irritant and toxic substances. The former causes distension of the abdomen. The latter are likely to increase the diarrhoea. This fermentation may generally be forestalled by peptonizing the milk and by administering drugs which act as intestinal antiseptics.

Fourth. It has been claimed that it is often impracticable to take a sufficient quantity of milk to meet the demands of the body for nourishment. The minimum quantity which is adequate to maintain proper nutrition has been calculated by some writers to be three quarts. However reasonable this may appear theoretically, those who have had much experience in the

treatment of typhoid fever, and the use of a milk diet as part of the treatment, can bear testimony to the facts that most patients maintain life very satisfactorily on two quarts of milk a day, and that, after the subsidence of the fever, they gain both strength and plumpness, while continuing on the same amount of the same food.

Some of the desirable characteristics of milk having been enumerated, some of its objectionable features having been discussed, and various methods for their removal having been suggested, it remains to mention some of the disadvantages associated with other foods.

First. It must be remarked most emphatically that in fever patients any form of solid food is exceedingly likely to increase the fever. The physician is never justified in causing his patient to incur this risk. Furthermore this danger does not entirely disappear until the temperature, during the entire twenty-four hours, has been normal for from seven to ten days.

Second. Foods consisting largely of starches, sugars, and fats are not digested, or at least only to a very limited extent, in the stomach. Consequently when the digestive power of the stomach is impaired, during the continuance of the fever, the presence in it of these indigestible substances interferes with the digestion and absorption of other foods, which *can* be digested there.

Third. Other foods are more likely than milk to undergo fermentation and putrefaction in the alimentary canal, with the production of toxic substances, which are absorbed, and increase the toxæmia, which is constantly present in the fever. These changes in the food are accompanied by and encourage bacterial growth, which it is important to repress as far as possible. Gas is abundantly produced, which causes distressing tympanites. The inflammation of the intestinal mucous membrane and the glandular ulceration are aggravated, and diarrhœa is increased.

Fourth. Even when other foods are prepared in liquid form, or are predigested, they are distinctly inferior to milk. While in the alimentary canal they are more likely than milk to increase the congestion of the mucous membrane, to undergo fermentation, and to act as a culture medium for micro-organisms. After they have been absorbed the extractive substances, and the various products of proteid metabolism, which they contain, are likely to aggravate the toxic condition already existing.

From this discussion two logical conclusions may be drawn:

First. In the majority of cases of typhoid fever the best food is milk, which should be taken every two hours, in such quantities that two quarts will be taken in twenty-four hours.

Second. A milk diet is best because it is both adequate and safe.

## JOURNAL OF ADVANCED THERAPEUTICS

New York, N. Y., January, 1906

1. Choice of Methods in the Treatment of Operable Cases of Cancer — G. Betton Massey.
2. The Roentgen Treatment of Tubercular Glands — George Coffin Johnston.
3. Treatment of Epithelioma by the X-ray — J. N. Scott.
4. Brief Report of Cases Treated by the High-Frequency Current — E. Gard Edwards.

1. See THE ARCHIVES for December, 1905, page 339.

2. See THE ARCHIVES for December, 1905, page 345.

3. See THE ARCHIVES for January, 1906, page 62.

4. Edwards excites his high-frequency apparatus with a sixteen 33-inch plate static machine revolving at a speed of 240 revolutions per minute, and applies the current by means of a vacuum electrode for periods of 20 minutes every other day.

He reports one case each of epithelioma of the lower lip, ulcer on tibia, eczema of hand, metritis, herpes zoster, and sciatica which were cured with from 10 to 30 applications; one case of uterine fibroid in which hemorrhage was eliminated and some decrease in the tumor was secured, one case of hay fever that was greatly benefited, and one case of tuberculosis of testicle in which 40 applications caused a fistula to heal and reduced the swelling very materially.

## ARCHIVES OF THE ROENTGEN RAY

London, England, January, 1906

1. On the Diagnostic Value of the Roentgen Ray for the Soft Organs of the Body — Ernest Kingscote.
2. The Exploration of the Thorax by Orthodiaphorgraphy (*Continued*) — H. Guilleminot.
3. A Report on the General Utility of High-Frequency Current (*Continued*) — H. E. Gamlen.

4. The Cooper-Hewitt Mercury Vapor Lamp and Valve (*Continued*) — Maurice Leblanc.
5. The "Gyration" Physical Exercise — Horace Manders.
6. Notes on X-Light (*Continued*) — William Rollins.

1. Kingscote found the Roentgen ray a valuable diagnostic agent in a case of dilatation of the heart. The case had been diagnosed previously as aneurism, new growth, and floating kidney. The patient suffered from emphysema, and when in the erect position a soft pulsating tumor could be felt in the epigastrium. The heart dullness extended nearly to the umbilicus. The skiagraph revealed a dilated heart pushing the diaphragm downward and dragging on the aorta. After a course of baths another skiagraph showed the dilation to have been practically overcome.

2. In measuring the excursion of the diaphragm by orthodiascopy errors are avoided, and the results can be considered as correct. A large number of such measurements leads the author to conclude, first, that the mean position of the diaphragmatic curve on the right side is 16.5 cms. below the suprasternal line, and on the left side 18.5 cms. below.

Second, the normal amplitude of the diaphragmatic excursion is from 16 to 18 mms. It is approximately equal on the two sides.

Third, any variation in the amount of the excursion on the right and left sides is a pathological symptom, and in most cases has a serious clinical significance. The difference in these excursions on the two sides is an important diagnostic aid especially in the tubercular. The functional costal angle in healthy subjects he has found to be equal on both sides, and to vary between five and six degrees.

3. Gamlen has treated a number of cases of phthisis. One patient received some fifty treatments with considerable improvement in her general condition,

but died some time after ceasing treatment.

A male patient 21 years of age, with bacilli in the sputum and a small infection of the right apex was treated daily for eight weeks; after the thirtieth treatment the upper chest was rubbed with creosote, and a brush discharge from the resonator directed upon it. Two years after treatment patient had gained 16 pounds, and there was no return of the trouble.

In a patient of 26, with well-marked tuberculosis of the left upper lobe with large numbers of bacilli in the sputum, treatment has been kept up for nearly two years with marked improvement, but the physical signs of the tuberculosis are yet present.

In a girl of 19, considerable benefit followed treatment, but she went into a sanatorium and died.

In a woman aged 36, with well-marked tuberculosis, bacilli in the sputum, treatment was followed by an increase in weight and reduction of the number of bacilli in the sputum, and the lung appeared much better upon X-ray examination. The cough almost disappeared, finally the bacilli disappeared from the sputum, no physical signs of tuberculosis could be detected and the patient was discharged.

Two other cases did not seem to improve. In bronchiectasis daily treatments will show a decided change in the character of the sputum. It becomes thinner and less offensive, temperature decreases, and the patients gain in weight and appetite.

In two cases of asthma local and general applications of high frequency produced substantial results.

In lumbago and sciatica high frequency proved beneficial. One bad case of sciatica was entirely cured by this agent alone.

He has also succeeded in curing a case of chorea in a child, which has remained well for four months.

4. The Cooper-Hewitt mercury valve rectifies an alternating current by means of that property of the cathode which Mr. Hewitt has termed its repugnance. When so employed the tube is furnished with two cathodes, one of which is connected with a battery passing a constant current, thereby maintaining its surface in a state of disintegration.

Now if an alternating line be attached to another cathode and to the anode, the current will pass easily from the anode to the cathode, but on the return wave, the cathode not having had its surface disintegrated will offer an enormous resistance, hence this circuit will be traversed by a uni-directional current, and if a self-inductance coil is introduced into the circuit we can render the current practically constant. The alternating current is only working half time, as the valve suppresses one phase. This may be overcome by passing the alternating current through the primary of a transformer which has two secondary circuits, one wound right-handed and the other left-handed, and the two anodes are connected to these twin secondaries. The other ends of the two secondary coils are connected and form a terminal at the cathode, the circuit including a self-induction coil. A battery is used to prime the tube. The self inductance of the coil prevents the current falling to zero during the break of the electromotive force in the secondary coils. These tubes are capable of rectifying currents of very high frequency, and it will thus be possible to transmit energy without wires! thus an automobile could be driven by means of a simple wire parallel to the road, owing to induction, without any trolley device whatever.

Alternating currents cannot be used to produce high-frequency currents, but the spark discharge has been so used in connection with the condenser. If it were possible to recharge the condenser after each discharge a current could be

obtained approximating the sinusoidal law.

By means of a small glass globe furnished with two similar mercury electrodes Mr. Cooper-Hewitt has solved the problem. The voltage required to send a spark between these electrodes can easily be made as high as twenty thousand volts, and if the globe is kept cool its resistance will remain constant. When primed, however, it requires but 14 volts to pass the current, and once the current sinks to zero the surface of the mercury ceases to be disintegrated, the repugnance of the cathode appears and the resistance is regained instantly. With this apparatus alternating currents having a frequency of one thousand per second have been obtained.

Mr. Cooper-Hewitt has shown that a vacuum tube becomes a better conductor of electricity as the vacuum becomes higher. The difficulty of priming the tube increases with the degree of vacuum, but is easily performed at any degree by simply short-circuiting the tube for a minute, but his greatest discovery is that property of the cathode termed its repugnance and the method of overcoming this repugnance.

5. Manders has devised this exercise for developing the muscles of the spinal column and those of the chest and abdomen, since the functions of the organs contained therein depend for their proper performance on the good condition of these muscles. Standing at attention, the right foot is carried 12 inches to the right, the arms extended over the head, palms forward, and the body bent forward until the tips of the fingers touch the floor, then by a series of twistings and contortions which are difficult of description, the body finally returns to attention. Each performance of this exercise takes a full minute, and should be repeated five to ten times on rising and retiring. The exercise has a wonderful effect in improving the

beauty and curves of the figure. It seems to have the same effect upon the patient that the Lance exercises have on the soldiers in a Lancer's regiment, such men being noted for their well-shaped and supple figures.

6. Rollins advises that the targets of X-ray tubes be placed at an angle of 56% with the cathode stream, and that tube screens should be used at all times.

#### ARCHIVES D'ELECTRICITE MEDICALE

Bordeaux, France, December 25, 1905

1. Radiotherapy in Tubercular Adenopathies — P. Redard.
2. Cancer of the Neck of the Uterus Successfully Treated by Radiotherapy — G. Haret.
3. Advantage of Stereoscopic Radiography for Examination of the Foot — T. Marie.
4. Tuffier's Localizer for Foreign Bodies.

1. Massive doses of X-rays have been used, 4 to 5 H. every 12 or 15 days. Benoist No. 6. No accidents have been noted.

X-rays have been decidedly favorable in cases of large, hard, fibrous adenitis of long standing. In three cases, the writer has obtained an almost total disappearance but he has never seen a case where the tumors have disappeared entirely. The treatment is long, and lasts at least six months. Redard has never seen the quick subsidence noted by some authors.

In cases of subacute adenitis still in a progressive state, X-rays are not indicated. In five cases of suppurative adenitis the results have been very remarkable. At first the suppuration increased, and after, the swelling subsided much more quickly than in non-suppurative cases, and the sinuses healed without depressed scar or keloid.

2. In a case of cancer of the cervix in a woman 75 years old, a radical operation could not be performed on

account of the age of the patient and of a small extension to the wall of the vagina. Haret gave Roentgen ray treatment, making the treated part absorb about 4 H. once a week.

A speculum was introduced, its extremity placed exactly at the lesion, and then the speculum was securely fastened to the operating table. Then the tube was placed in Dean's lead-glass shield, to which had been adjusted a tube which was introduced into the vagina so as to protect the walls. The diseased part was 20 cm. distant from the anti-cathode. The violent pains disappeared after the second treatment. After six treatments (six weeks, 24 H. Benoit No. 6) the lesion had entirely disappeared. Such cases will remain infrequent enough, because although there was a vaginal extension, the cancer itself was limited and had not existed for a very long time, and surgeons prefer to operate on these cases, rather than send them to the radiologist.

3. The foot is an assemblage of very irregular bones and an ordinary radiograph is often very difficult to interpret; the shades of the bones projecting over each other, opacities result which may lead one to believe that there is a lesion when there is none. Prof. Marie relates a case in which a sudden and painful tumefaction of the foot after a long walk seemed suggestive of a traumatic lesion. Three ordinary radiographs seemed confirmative of that opinion, but stereoscopic radiographs showed very plainly that there was no bony lesion at all. Such mistakes must be frequent. Prof. Marie has not found in his large practice of radiography as many localized lesions of the foot as some radiologists seem to find, and he feels a little skeptical about their apparent frequency.

4. Tuffier's apparatus is formed by, first, a flexible metallic band which owing to its malleability can be applied exactly

around any part of the body; second, a support fixed on the metallic band by a pression screw; third, an indicative lever, fastened to the support by the intermediary of a knee articulation, and which can be orientated in any direction.

Let us suppose a bullet located at the intersection point of two perpendicular lines. A first radiosscopic examination enables us to mark a first guiding point, which is the emerging point of the ray passing normally through the bullet. The point where the same ray enters the body is also marked. Same determination is made in a direction perpendicular to the first and in the same plane. The marked points are made indelible with a slight touch of the cautery, so they will not fade away during the cleaning process on the operating table.

Then we apply exactly the metallic band over the part, and we see that the notched edge of said strip comes to the level of the four marked points which are identified upon the metal band. Then the band is withdrawn, great care being taken not to deform it. Two threads are stretched between the guiding marks. The intersection of these two threads gives the exact location of the bullet.

Then the band is replaced on the part, the support is solidly fastened to it, and the clamp is placed at the point where the cutaneous incision will be made.

Once more the band is taken away from the body, the point of the indicative lever is brought in contact with the intersection point of the threads and the length of the lever necessary to establish this contact is noted. A movable screw which is placed on the indicative lever is then fastened so as to act as a stop when the surgeon shall have carried the incision to the necessary depth, and the whole appliance is placed, this time definitely, on the patient; the surgeon makes his incision at the point and in

the direction indicated by the lever, till the limiting screw shows that the necessary point has been reached.

This apparatus and this technique are much simpler than any used so far in the operating room. Of course its utility depends on being able to secure a good fluoroscopic image of the bullet.

BULLETIN OFFICIEL DE LA SOCIETE FRANCAISE D'ELECTROTHERAPIE ET DE RADIOLOGIE.

Paris, France, November, 1905

1. High-Frequency Currents in the Different stages of Pulmonary Tuberculosis — H. Thielle.
2. Diseases of Malnutrition, Gout, Arthritis, Lumbago, Subacute and Chronic Rheumatism, Treated by Sinusoidal Voltaic Currents — H. Thielle.
3. The Spark from the High-Frequency Resonator in the Treatment of Small Epitheliomata — Oudin.

1. From a study of 26 cases, the writer concludes as follows:

High-frequency effluviation has an evident influence on respiratory exchanges, increases respiratory capacity, raises the co-efficient of oxydation, and lowers the co-efficient of absorption. This influence persists after treatments have been stopped. Effluviation increases the acidity of urine and stops demineralization; it increases the hemoglobin percentage, the number of red blood corpuscles, and generally decreases the number of leucocytes. Remineralization of the organism is a very important factor in the improvement; though the leucocytes are fewer in number, they are more apt to fight the bacillus and the tissues become chemically less favorable for the development of the latter. The number of lymphocytes is increased, the general condition is always improved. Respiration is freer, oppression and dyspnoea disappear quickly.

Coughing is modified from the start,

but its disappearance comes sometimes only after a long period. Sometimes effluviation produces a sort of dry cough due to the ozone (or nitric acid? Ed.) generated by the apparatus.

Expectoration becomes easier and generally stops before the end of the treatment.

Bacilli disappear either during the first month or at the end of the treatment.

Only in one out of 26 patients did they reappear, and then only temporarily after a severe attack of grippe.

There is a corresponding improvement in the general condition and the weight increases, but there are considerable variations.

In feverish patients and in patients with cavities, the same effects are noted but they do not last. There is a very distinct symptomatic improvement but there cannot be any hope of a permanent cure.

2. The writer simply reports the clinical histories of thirteen patients afflicted with the above-mentioned diseases, and who were cured by the use of the alternating sinusoidal current.

3. Since we have had powerful enough apparatus, the high-frequency spark is, according to Dr. Oudin, the method of choice in the treatment of small epitheliomata, better even than radiotherapy, because much easier to employ in certain regions, such as the vicinity of the eye and the nose, because also more uniform in its results and at least as fine in its ultimate results. It enables one to destroy perfectly in two treatments all the morbid structures and nothing else.

In one case of small epithelioma of the internal angle of the eye, radiotherapy gave a temporary success, but recurrence came. High-frequency sparks gave them a permanent cure with excellent cosmetic results. Dr. Oudin has had four other similar cases.

Dr. Oudin emphasizes the fact that the

end results are at least as good as with radiotherapy. The method is much simpler and quicker. The technique is the following: Gaiffe's closed magnetic circuit transformer is set almost to the minimum, the spark gap measuring only one cm. The active electrode connected with a well-regulated resonator is a metallic rod with rounded extremity and screwed on an insulating handle. This handle is held by the operator in his right hand, the index finger in wide contact with the metallic part. The left hand is applied on the skin of the patient in the vicinity of the tumor. When the metallic rod is applied to the diseased part and moved over its surface, very fine almost painless sparks are produced, and these produce a slight anesthesia; then, after one minute, the left hand is removed, the sparks become stronger and more painful, the structures become anaemic, pale, and insensible. When this preparation is sufficient, the index finger is withdrawn from the contact with the metallic part, and the surface is riddled with sparks till it is well cauterized. Cocaine may be previously used as an anesthetic, to make the treatment almost painless. In cases of warts, it is a good plan several hours before the treatment to apply a wet dressing

of cocaine solution covered with protective.

Under the downpour of sparks, the tissues become at first white, then yellowish, at last brown as if roasted, and the dry eschar separates after a few days. The surface is then smooth, pink, has a very nice appearance and heals very quickly. During the treatment a little blood may ooze from one or two points; the hemorrhage is readily stopped by quickly riddling the bleeding point with sparks. During and after the operation an abundant serous oozing is frequent.

Oudin tried several years ago the same treatment with less powerful appliances. The results were not satisfactory enough to warrant publication. He does not believe that the action of the high-frequency spark is merely that of a thermic caustic, but thinks that the spasmodic contraction of capillaries and the cellular necrobiosis due to electricity play an important part. He has not yet had any occasion to treat by this method cancers of the tongue or of mucous membrane. It would be most interesting to find out if those cancers which are refractory to radiotherapy, would not be amenable to high frequency.

## RADIODIAGNOSIS

### HAND PROTECTION IN ROENTGEN PRAXIS

Henry G. Piffard, *New York Medical Journal*, January 6, 1906

Piffard early realized that the radiation from a Crooke's tube was an unknown quantity, and he therefore experimented prudently, thereby escaping himself many of the unfortunate effects which bolder or less well-informed operators suffered. Those rays which

pass through tissue without hindrance do not affect it, but those that are arrested or absorbed by the tissue produce trouble, and if employed for prolonged periods the results are disastrous upon the integument. The use of the hand as a penetrometer was responsible for the pitiable condition of the nails and skin shown in so many of the older operators. In some cases fingers, hands, arms, even life itself, have been sacrificed from this practice.

Every tube in action gives off rays

that merely penetrate the skin, others that are absorbed by the soft tissues, some that penetrate into the bones, and others that pass through everything in their path. In addition a few cathode rays issue from the tube, also secondary rays, and the tube is surrounded by an electrostatic field. The effect of these latter upon the tissues is as yet unknown.

Instead of the hand the author employs a modification of Benoist's radiochromometer, changing it from a circular to a linear form. For use with a fluoroscope, however, as a tube tester, he prefers a radius or ulna cut in two and the pieces mounted side by side on a board. He regrets that many radiotherapeutists neglect to test their tubes before treatment in the manner that the radiographer does before making a picture, and believes that some men treat their patients without any idea of the state of tube or quality of the ray employed, and then wonder why they do not obtain the therapeutic results constantly shown in the practice of experts, who do not neglect this important knowledge.

He endorses the use of tube shields such as the Friedlander and the various lead-glass shields, but finds it simpler to coat his tubes with lead paint over the active hemisphere, leaving a window opposite the target. Such protection effectually cuts out the caustic rays.

Many tubes, however, give off quantities of X-rays from the hemisphere behind the target and are particularly dangerous. When a tube is operated on a static machine which has no inverse current, the posterior hemisphere is rarely seen to give off X-rays, and if a tube when used on a coil is protected by a valve tube in series with it, a clean hemisphere is thereby obtained, but the ideal safety tube is one made of lead glass with a small window of soda glass. Such tubes, however, cannot be made larger than four inches in diameter, but by joining two of these bulbs together

sufficient capacity is obtained to enable the tube to preserve its vacuum. The author illustrates and has designed such a tube, but it is suited only for the treatment of superficial lesions and is provided with a self-regulating device. He also illustrates a tube devised by Dr. Besser, of New York, which is very convenient and enables applications to be made in positions which could not be reached with the ordinary tube.

The use of rubber gloves is not popular because of their clumsiness and they are soon abandoned. It is his practice to use a pair of driving gloves old and flexible, coated with six coats of white lead paint on the back; such a glove will protect the hands perfectly. For the protection of the body of the operator, it is best to have the apparatus so arranged that it can be controlled from a retreat or from an adjoining room, the tube itself being observed by means of a mirror, tests having been made to demonstrate that the retreat behind the screen or in the adjoining room is safe during the operation of the tubes.

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#### A SIMPLE INSTRUMENT USEFUL IN X-RAYING A STRICTURE OF THE OESOPHAGUS

Swithin Chandler, *New York Medical Journal*, January 13, 1906.

The author suggests the use of the device illustrated herewith for ascertaining the extent of a stricture of the oesophagus.



The device consists of a medium-sized bougie upon one side of the bulb of which is fastened a ring of such a size as to slide easily over the shank of another large bougie. The larger bougie is passed through the stricture and drawn back against its inferior limit; then the ring of the smaller bougie is

passed over the shank of the larger one and the bulb of the smaller bougie passed in until it engages in the superior limit of the stricture. The shanks are then

tied together and as both bulbs are of metal a skiagraph will give definite information regarding the location and extent of the lesion.

## RADIOTHERAPY

### OBSERVATIONS ON THE USE OF THE X-RAY IN THE TREATMENT OF CERTAIN DISEASES OF THE SKIN

Fred Wise, *Medical Record*, Jan. 20, 1906

Wise considers that the employment of the X-ray in ringworm and favus has given results which can justifiably be characterized as brilliant. Cases of tinea tonsurans which have been managed by the most painstaking treatment by lotions, pastes, and salves for years, sometimes clear up in a most remarkable manner after a dozen exposures to the X-ray. At the clinic of the New York Skin and Cancer Hospital a case is considered cured when no trace of the fungus can be discovered after repeated microscopical examinations. All cases of ringworm and favus treated at this institution are brought to the dispensary at least once a month and microscopical search made for spores. Of the cases of favus and ringworm of the scalp not one has shown a recurrence after six months of observation. Of the cases of barber's itch, all of which were treated in the out-patient department, about  $\frac{1}{3}$  showed trifling recurrences after a period of from three to six weeks following such exposure. Wise thinks recurrence in these cases may be due to the fact that the same amount of care cannot be given out-patient cases as indoor cases.

Non-parasitic sycosis, or sycosis staphylogenies, and simple folliculitis of the bearded region can be cured by comparatively few exposures. In this class of cases it is not necessary to prolong the treatment to the point of depilation,

as cases frequently get well before the hair begins to fall out, and even before the slightest erythema presents itself.

A condition which is sometimes very annoying is that of ingrowing hairs sometimes observed on the necks of young men who use the razor. Nothing in the line of local treatment can approach the X-ray in the cure of this unpleasant condition.

In hypertrichosis the X-ray appears to have been something of a disappointment. Although repeated exposures will cause a permanent alopecia yet it is necessary to effect defluvium repeatedly before the alopecia becomes permanent. This usually results in an atrophic condition of the skin which is as much of a disfigurement as the hypertrichosis.

In lupus vulgaris Wise recommends the administration of internal remedies which are directed against the invasion and multiplication of the tubercle bacillus, and considers that on the whole the X-ray has been found to have a wider range of usefulness than the Finsen light, especially in cases which cannot be conveniently dehematized before the application of the ultra-violet ray, as for example, in lupus of the face where the septum of the nose is involved, in lupus of the ear, etc.

Lupus erythematosus is not treated by the X-ray at the New York Skin and Cancer Hospital, as it is believed that more satisfactory results are obtained by the employment of local operative and medicinal measures, combined with constitutional remedies appropriate to each patient.

Tuberculosis verrucosa cutis has been

treated with promising results and with one apparent cure. Wise believes it preferable, however, to treat these lesions on surgical principles, and to ray the diseased area after it has been removed as thoroughly as possible by the operation.

In keloid X-radiation gives better results than any other agent and effects complete disappearance of the growth and its replacement by a smooth white scar. It is sometimes necessary to push the exposures up to the point of ulceration, and when this heals and the scab drops off a large portion of the tumor will be found to have disappeared. Where pain exists X-radiation frequently alleviates this symptom. In the extensive, diffuse keloidal conditions following burns, the results have been unsuccessful.

In several cases of keratosis palmaris et plantaris the palm of the hand and sole of the foot on one side were treated with the X-ray, and the hand and foot on the other side with strong salicylic acid plasters. Those lesions treated by the X-ray showed much the better results, the application causing no inconvenience, the effects being more lasting, and the necessity of having the hands covered with plasters and bandages being eliminated.

Some cases of chronic, indurated eczema accompanied by severe itching, and the hypertrophic form of lichen planus, which are very resistant to the ordinary methods of treatment react very favorably to X-radiation; the itching disappears, the skin softens, the induration and infiltration lessens, the joints become limber and the general health of the patient improves. It should always be remembered, however, that achievement of the best results involves the administration of a proper internal and external adjuvant treatment in addition to the use of the X-ray. Many rebellious cases of skin disease are due chiefly to errors of metabolism, hence it would be

inconsistent to rely entirely upon local treatment.

Wise has treated four cases of mycosis fungoides, the patients showing marked subjective and objective improvement as soon as the exposures were commenced; the itching was relieved, the tumors flattened and disappeared, ulcers healed up, weeping and indurated eczematous patches gave place to apparently sound skin, and the general health improved. Recurrences appeared in three of the four cases within a month after the cessation of the treatment, and the real value of radiotherapy in this disease must be referred to the future for decision.

The author's experience with epithelioma in the skin has not been as gratifying as that of some other men, and he recommends surgical extirpation to be followed by a course of radiotherapy.

One case of "psorospermosis follicularis (Darier's disease) was given X-ray treatment, after other methods of treatment proved futile; the patient, whose feet were diseased to such an extent that walking caused much suffering, was enabled to perform her household duties without discomfort, after having received about thirty exposures.

"A case of idiopathic multiple hemorrhagic sarcoma is now under treatment at the hospital. After only six exposures, of ten minutes' duration, to each extremity, the edema has lessened, infiltrated patches have softened, and bluish-red and violaceous patches of skin are beginning to turn pale and to take on a normal appearance. No internal treatment is being administered."

From his experience Wise concludes as follows:

"(1). The X-ray will cure ringworm and favus of the hairy skin more rapidly and reliably than any other method of treatment; the advantages of the method are, that it is painless, harmless when properly used, and thorough, and that it cuts down the expense in-

curred by the city in the treatment and care of these patients to a very considerable extent.

"(2). Hypertrichosis should be treated wth electrolysis, not with the X-ray."

"(3). The X-ray gives very satisfactory results in the various forms of cutaneous tuberculosis; in keloid, in keratoses, in infiltrated patches of chronic eczema, lichen planus, pityriasis rubra; in the tubercles, ulcers, and tumor-masses of mycosis fungoides, psorospermiosis and sarcoma.

"(4). In selected cases, radiotherapy is the ideal agent in the treatment of epithelioma and rodent ulcer."

He gives no details of the technique which he employs.

#### THE ROENTGEN TREATMENT OF LUPUS VULGARIS

James W. Hunter, *New York Medical Journal*, January 27, 1906

Hunter states that the ideal Finsen light treatment can only be found at Copenhagen or London, but that good Roentgen work is easily obtainable, and his experience has led him to believe with Leopold Freund that the merits of the Finsen-light treatment and the Roentgen-ray treatment as regards lupus are about equal, but that whatever advantage there is is on the side of the Roentgen ray. While there are some cases that will not respond to the Roentgen ray and will respond to the Finsen light the reverse also is the case. In addition to this the Roentgen treatment is less wearisome to both patient and physician, because the time required for each seance is less, and the total period during which applications must be made is shorter. The cosmetic results are all that could be desired.

There is this difference between malignant disease and lupus from a radiotherapeutic standpoint. In malignant disease the cells although they grow

faster are less resistant to destructive influences than normal cells, hence healing may be produced by Roentgen radiation with but little dermatitis. Lupus, however, is a bacterial disease and of unusual resistive tendencies, hence the dermatitis must be carried as far as practicable and yet a considerable margin allowed for safety. Too much radiation will have the same effect as the actual cautery.

Hunter employs "a 12-inch coil with two layers of the primary connected in series (there are three of these layers in my coil), a moderate interruption (10 per second), and a primary current of 2.5 amperes at 110 volts, O. C. Such a current produces a thin spark from four to six inches in length, and, with a medium soft tube (self regulating; six inches in diameter) at ten inches (from target), should produce a dermatitis in from 90 to 100 minutes. The patient is protected by a covering of lead foil, holes being cut where the skin is to be exposed. For this purpose I use the heavy foil on tea chests. This is comparatively inexpensive, so that every patient has his own mask."

His technique consists of daily exposures of 10 minutes for the first three or four times, and then three times a week for six more sittings, by which time a slight dermatitis should be observed. Even if the dermatitis is not observed the sittings should be interrupted for a week, since it is impossible to tell positively whether a sufficient dosage has been given until such time has elapsed. If it does not appear within a week two or three more sittings should be given with an interval between of at least three days until a sharp dermatitis results. This will produce aggravation of the original trouble, exquisite itching, profuse discharge and a heavy scab. Gradually the dermatitis subsides and healing ensues. If, however, there has been no healing by the third or fourth week after the last exposure the sittings

are again resumed but of less duration and more infrequently. If the process extends deeply into the subcutaneous tissue he recommends accompanying the radiation by some fluorescing agent, as sodium cacodylate *a la Pusey*, in doses of from one-half to three-fourths of a grain three times a day after meals, and feels that he can testify to its effectiveness.

Boric acid vaseline dressing on the lupus patch itself is unobjectionable but a heavy scab is much to be preferred. Other remedies such as tonics, bitters, carminatives, cathartics, etc., should be used as needed for other conditions.

The cure of lupus by this method seems to be permanent, but no matter how perfect is any line of treatment some relapses must be expected. These, however, in his experience have always yielded well to a few additional sittings, with the exception of one case. He considers it the most effective therapeutical agent that we now possess for the management of this condition.

#### THE USE OF X-RAYS IN CARCINOMA

W. A. Pusey, *Annals of Surgery*, Dec., 1905

Pusey believes that all types of superficial epitheliomata are susceptible of destruction by the X-ray, and that all types respond with an equal degree of readiness. There is, however, a vast difference in the responsiveness of different cases of this nature, which he believes to be due to individual idiosyncrasy. Such a cancer is cured by replacement of the malignant tissue by connective (healthy scar) tissue. He believes that in epithelioma which does not deeply involve the subcutaneous tissues or surrounding lymphatic glands, the X-ray should be preferred to surgical extirpation, as the cure is just as radical and the local conditions after healing are much better. He includes cancer of the lip in this category.

In two cases of primary mammary carcinoma involving the axillary glands

it was possible to demonstrate microscopically just what histological changes the X-ray had produced, as the patients died from inter-current conditions shortly after. In both cases connective tissue was found to have entirely replaced the malignant tissue, not a trace of the latter being discernible, in both mammae and axillae.

As regards the more deeply-located carcinomata Pusey has cured recurrent cases of the chest-wall even when the supra-clavicular and axillary glands and the ribs were involved. One very interesting case of uterine cancer he records as follows: "In April, 1904, Mrs. —, about 35 years of age, was referred to me by Dr. Sylvan King. Six months previous the uterus and ovaries had been removed by Dr. King for carcinoma. New nodules very soon appeared in the scar, and, in spite of assiduous treatment in the usual way, grew very rapidly. In April, 1904, there was a large nodular mass at the site of the scar in the vagina, larger than could be taken in by a Ferguson speculum. The patient's general condition was good. In four weeks under X-ray exposures, given directly *per vaginum*, this tumor had entirely disappeared, leaving no trace; discharge and hemorrhage permanently ceased; and for a year now there has been no suspicion of recurrence. As far as the patient knows, she is perfectly well. Her physical condition is as good as it ever was." In operable, deeply-located carcinomata the knife is preferable to the X-ray, and not much can be hoped for from it or anything else in cases exhibiting widespread general metastases; even in the last-mentioned condition, however, the patient's general condition and comfort can sometimes be improved.

It is not probable that the ray ever stimulates malignant growths even when administered in weak dosage, as the influence exerted by them upon carcinoma

cells is destructive in its tendencies from start to finish; neither is it probable that the danger of metastasis is increased, because, although it is conceivable that carcinoma cells might be liberated into the circulation through X-ray effects, yet when they had been affected sufficiently to produce such liberation they would certainly be in no condition to proliferate. Further, he has seen no cases in which the clinical phenomena were such as to lend any weight to these hypotheses. Technique is not discussed.

#### THE PRESENT STATUS OF ROENTGEN THERAPY IN LEUCÆMIA

Paul Krause, *Zeitschrift für Elektrotherapie und Elektrodiagnostik*, Dec., 1905

Krause gives extensive casuistic contributions to the treatment of leucæmia by means of X-rays. The first case, which is especially interesting, is as follows:

J. J., a farmer *æt.* 28, fell sick with the characteristic symptoms of leucæmia, as swelling of the lymphatic glands on the neck, etc., pain, loss of flesh, also retinitis leucæmia, etc. Within two months after treatment was commenced the number of leucocytes went down from 500,000 to 212,000, his weight increased from about 130 pounds to 142, but the swelling of the spleen did not diminish at all until nine weeks after treatment was begun. In this case, therefore, a very marked improvement set in, although somewhat late.

In spite of this and similar cases the author comes to the conclusion, that up to date there is not one case of leucæmia on record in which beyond doubt a complete cure has been achieved. The reports of "cures" of this disease by means of Roentgen rays, deposited in foreign literature, especially in France, are unreliable.

#### RADIUM, ITS KNOWN MEDICAL VALUE

Myron Metzenbaum, *Medical Record*, Jan. 6, 1906

From a study of the literature of the

subject and from a fairly extensive personal experience covering a period of nearly two years Metzenbaum concludes regarding the therapeutic utility of radium as follows:

" 1. That lupus responds promptly to the action of radium, and that this result is obtained as readily as with the Finsen light or the X-rays, and that these results seem permanent.

" 2. That small epitheliomata, without glandular involvement, heal rapidly under the action of the radium rays.

" The epitheliomata may be situated on the face, within the nasal cavity, mouth, pharynx, larynx, vagina, rectum, or bladder, provided the tubes of radium can be brought into intimate contact or close proximity to the diseased area.

" Large epitheliomatous areas of the mucous membranes may not be influenced to any marked degree, probably because in large areas the disease is not only superficial but the deeper tissues are involved as well. Epitheliomata on the skin respond far more readily than those of the mucous membranes; this is probably because the skin is kept dry and is not irritated by moisture or friction of the parts. The healing of epithelioma under the action of the radium rays seems to be permanent.

" 3. The rodent ulcers about the face and head respond better to the action of radium than to any known agent excepting the X-rays, and the results are better than those usually obtained by surgical interference.

" 4. Deep-seated, malignant growths seem beyond the influence of the radium rays, and even when an incision is made into the growth and the tube of radium is inserted into its interior there is then only a histological change in that part of the growth surrounding the tube of radium, as is demonstrated by a microscopical study of the tissue. Even if the radium rays exerted any beneficial influence on truly malignant, deep-seated

growths, the fact could not be used to any great advantage in these cases, for the local action would be so pronounced as to cause an ulceration of the skin before it could influence the growth beneath.

"5. In certain cases of total blindness, possibly where some of the fibres of the optic nerve still remain intact, a sensation of light may be noted when a tube of radium of high activity is placed in front of the eye or against the temporal region. But thus far radium has given no beneficial results in the treatment of blindness.

"6. When tubes of radium are applied to old scars resulting from healed lupoid ulcers, it causes them to lose their rough and fibrous appearance and ren-

ders the area quite smooth and pliable, so it resembles more nearly the healthy tissue.

"7. Radium cannot be used like the X-ray to obtain skiagraphs, for it requires at least twelve hours' exposure before the rays penetrate the hand, and then there is not as sharp a differentiation between the tissue as is shown by the X-rays. Again, from such a long-time exposure the skin would be so irritated as to cause it to ulcerate.

"8. The beneficial results obtained from radium have been equally good when using tubes of low activity, costing but a few dollars, as when using tubes of very high activity, costing several hundred dollars."

## DIETOTHERAPY

### THE DIETETIC TREATMENT OF NEPHRITIS

F. C. Shattuck, *The Journal of the American Medical Association*, January 6, 1906

So powerless are we directly to influence the kidneys by drugs that diet becomes of prime importance. The principle which should guide us may be expressed in one word,—rest, provided that we remember that in the living body rest is a relative term.

1. ACUTE NEPHRITIS. For twenty-five years it was almost universally considered the best practice to give a rigid milk diet in these cases and to force water. Water was regarded as the best diuretic. The idea underlying the large ingestion of water was to scour the blocked tubules. But it now appears that in many cases the main trouble lies behind the tubules in the glomeruli, the incapacity of which to filter is, in the acute stage, more likely to be increased than diminished by increasing the blood mass and blood pressure. Starvation is now

considered the best dietetic treatment of acute nephritis, absolute starvation for a few days in the severe cases with very scanty or suppressed urine and œdema of rapid onset and growth. In less severe cases, a quart of milk may be given daily, and the needs of the system eeked out by cereals and fats in moderate amount. The phosphoric acid in the milk can be precipitated in the intestine by the addition of small quantities of calcium carbonate. The quantity of food is to be gauged by the degree of kidney disablement as measured by the amount of urine rather than by the amount of albumin, by the state of nutrition of the patient and his gastro-intestinal digestive power, all combined. As convalescence advances the quantity and variety of food should be increased, including proteids. Animal broths contain little of nutritive value, but extractives, which are dangerous to those liable to renal intoxication. They are almost the last things to be allowed.

2. CHRONIC NEPHRITIS. The dietetic management of acute exacerbations of the chronic form of the disease is essentially the same as that of the acute disease, except that patients suffering from the former may not tolerate as complete or prolonged starvation as may be safe in the latter.

Clinically chronic cases may be divided into two classes,—those with and those without dropsy.

In cases of chronic nephritis with dropsy, especially if the dropsy is mainly of cardiac origin, limitation of liquids is important as a rule. In some cases, water may be excreted with difficulty by the kidneys and, if the myocardium be at all insufficient, increasing the blood mass merely increases the load of the already overburdened heart. Cases must be individualized, and an effort made in each case to adjust the amount, quality, and variety of the food to the needs of that particular case at the given time, according to the stage and intensity of the renal process, the condition of other organs and of the whole organism.

In cases with dropsy, with a strictness largely proportional to the degree thereof, a relatively dry diet is advisable. In some cases we have erred in the past in forcing water, even in the absence of dropsy, thereby endangering the compensatory hypertrophy of the left ventricle on the maintenance of which life often depends more than on the kidneys, to the slow wasting of which the system has a chance to accommodate itself. An exclusive milk diet is seldom desirable. A varied diet with a fair amount of proteid may be allowed. Meat may be eaten once a day and fish and eggs at the other meals. More patients with chronic nephritis suffer from an insufficiency than an excess of proteids. Cooking should be simple. Spices and condiments may be undesirable, and should be prohibited. Green vegetables and fresh fruits in their season are almost without exception permissible, nay de-

sirable. The prohibition of red meat, and of water with meals, results in a limitation of food and of drink. Both are fads, and should be replaced by rational dietetic directions. The evidence in favor of a low sodium chlorid allowance is not yet entirely conclusive.

The leading principles pertaining to the dietetic treatment of nephritis may be stated somewhat as follows:

1. Such control as we may have today of nephritis lies in diet and mode of life rather than in drugs.

2. Such drugs as are useful are so in their effect on the general organism, or on the heart rather than on the kidneys directly.

3. In all cases of nephritis our broad aim is to spare the kidneys unnecessary work, not forgetting that the urinary is but one of the systems which comprise the body.

4. In acute nephritis, as well as in acute exacerbations of the chronic forms, doctors, diet, and quiet should work together. Starvation for a few days, proportional to the intensity of the process and the strength of the patient, is the keynote of the dietetic management.

5. In the chronic forms dietary restriction should be in the main quantitative rather than qualitative, and its principles should be carried out persistently, not spasmodically. Alcohol in moderation is not necessarily a poison, and may be an aid to digestion.

6. The excess of proteid, not proteid in itself, is harmful to the chronically sick kidney.

7. A varied is more likely than a monotonous diet to promote the manufacture of good blood, and thus to promote good nutrition of the body in general, and of the myocardium in particular.

8. The amount of albumin is in itself no guide as to the amount of dietary restrictions.

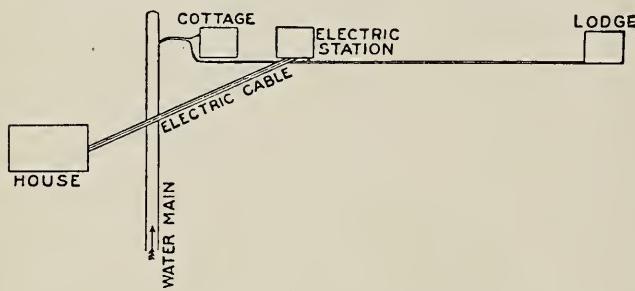
## LEAD POISONING FROM ELECTROLYSIS OF WATER PIPES

Geo. A. E. Roberts, *The British Medical Journal*, January 20, 1906

Roberts was called to attend a man suffering from lead poisoning which was found to be caused by drinking water which contained 0.14 grains of lead to the gallon. The source of this water supply was a deep well in the chalk, and the water exhibited very great organic purity with a total hardness of six degrees. In every instance the service pipes were of lead and the water had never been known before to attack them so injuriously as to make it toxic.

The water from the tap in the cottage where the patient lived was slightly turbid, whereas normally it was quite clear. A piece of this lead service pipe was cut off near the cottage, and on the interior were found patches of lead carbonate which projected about one-eighth inch above the internal surface of the pipe, and could be easily brushed off with the finger like a white powder. The turbidity of the water was probably due to this substance held in suspension.

A plan of the positions of the various elements in this problem is given in the figure herewith, and Roberts' description of the conditions is as follows:



"The cottage was the entrance lodge to a large house situated some 200 yards away, and midway between the two was an electric-light station which supplied the house but not the lodge. It was thought by the water company's consulting engineer that the lead in the water

was due to electrolysis, caused by a leak from the electric cable.

"The water main is situated in a road between the large house and the electric station. From the main a lead service pipe about 150 yards long supplies the lodge, and on its way branches to the electric station, and to another cottage close to it. The pipe from the main to the electric station was put in two years ago, but it was only continued to the lodge six months since.

"The electric current is supplied to the house by means of an insulated positive main and an uninsulated copper strip return; the latter is supposed to be earthed at each end, but both are enclosed in a wooden trough and embedded in bitumen. The cable passes about 18 inches above the old portion of the service pipe near the electric station. After numerous tests by a firm of electricians employed by the company a leak of 1.8 volts was discovered, and this in their opinion was sufficient to cause the electrolysis.

"The lead service pipe was examined at various points, and was found to be most affected near the lodge, whereas close to the electric station it was hardly affected at all. The electricians account for this by the fact that the difference of potential between the pipe and the earth would become greater the farther away one gets from the source of leakage. The old portion of the pipe was also examined where it passes beneath the cable but was not at all affected, owing, it was supposed, to a protective coating of oxide having formed. Only the inside of the pipe was affected, the outside showing no sign of deposit or corrosion."

Numerous samples of the water from other houses supplied from this source were examined, but no lead was found. Roberts considers that if a small leakage of electricity (1.8 volts) can produce electrolysis in this way that quite serious

results might be produced in cities where lead pipes and electrical conduits are so common and so close together, and he

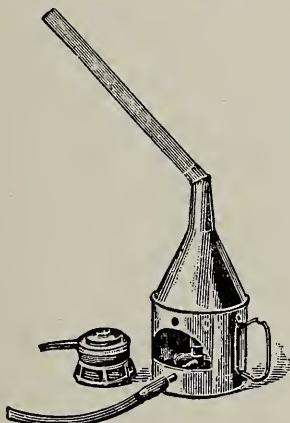
strikes a note of warning in reference thereto.

## AEROTHERAPY

### THE THERAPEUTIC VALUE OF WARM MOIST AIR AND HOT DRY AIR IN THE TREATMENT OF DISEASES OF CHILDREN

Theron Wendell Kilmer, *Medical Record*,  
January 27, 1906.

Kilmer has devised an apparatus which may be used for the generation of either moist or comparatively dry hot air for the treatment of diseases of children, which consists (Fig. 1) of a tin



funnel chimney, a fire pot containing a Bunsen burner when using gas or an alcohol lamp when using alcohol, a water boiler with a cover, a jointed tin tube in two sections with a chamber provided for the insertion of gauze when it is desired to produce a medicated moist hot air, and an asbestos tube.

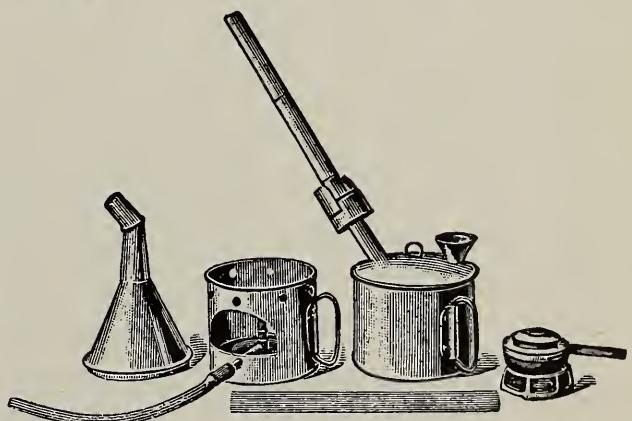
When the apparatus is used for the generation of moist hot air (Fig. 2) the boiler is filled half full of water and set on top of the fire pot. If medicated steam is required place a piece of surgeon's gauze saturated with the required medicament in the small gauze chamber, when the steam passing through this will become impregnated therewith. When the water has boiled

down and more is required pour it in through the small funnel in the boiler cover.



When it is desired to make an application of plain dry hot air place the funnel chimney over the fire pot (Fig. 3) and the asbestos tube over the end of the funnel chimney, discarding the water boiler altogether.

Confinement of the hot air is secured by draping a sheet over the crib and tucking it in tightly around the bottom



so as to make a tent over the child; the end of the asbestos tube, in the case of dry hot air, or the spout of the water boiler in case moist hot air is required, is inserted under the edge of the sheet. If it is necessary for the child to be held

## AEROTHERAPY

in the arms confinement of the air about it may be secured by draping the sheet around the shoulders of the person who holds the child.

The cough, stridulous inspiration and cyanosis of acute catarrhal croup are relieved almost at once by the inhalation of either plain or medicated moist hot air. For ameliorating the symptoms of bronchitis there is also nothing so efficient as this agent. In bronchitis inhalations should be continued for half an hour once every two hours. Attacks of asthma are quickly aborted by the same measure. In pneumonia inhalations of moist hot air constitute one of our most efficient therapeutic agents, and in diphtheria congestion and dryness of the throat will frequently be most happily relieved thereby. In laryngitis plain moist hot air, or medicated with benzoin or turpentine, will be found of great benefit. In whooping cough the paroxysms are frequently greatly relieved by treating the child two or three times a day.

In some cases it is best to keep the treatment up continually, as for instance, in the case of an infant of six months which was suffering with capillary bronchitis, the croup kettle was kept going for seven days and nights. Whenever the same was stopped the condition of the patient became worse. Under such conditions of course a continuous flow of fresh air in the room must be provided for. Moist hot air also acts efficiently upon tonsilitis, when the affected organs are large and the throat red and swollen.

As regards the use of dry hot air in nephritis Kilmer says that the effect of a ten-minute bath upon an infant with acute nephritis where there is diminished urine, puffy eyelids, swollen ankles, and a dry skin is almost magical. The baby should be placed upon a rubber sheet which is covered with a white sheet. A sheet and one or two blankets are placed over the patient excluding the head, and held above the body by strings fastened

to the sides of the crib so as to form a tent from ten to fifteen inches in height. After the bath the patient's skin should be dried. The head should be kept cool by the use of cold wet compresses. One or two applications of dry hot air to a sprained joint are usually all that is necessary to effect a cure. In rheumatism this method of treatment is most satisfactory.

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#### A STUDY OF THE SUPERHEATED AIR TREATMENT OF EAR DISEASES

Lester M. Hubby, *Medical Review of Reviews*, December, 1905

Hubby enumerates briefly the physiological facts upon which he bases the treatment, concluding that in diseases of the ear the emphatic local hyperaemia produced by the application of heat should improve the local nutrition; the blood stasis would be relieved by the circulatory stimulation; and the exudation and swelling produced would allow greater stretching of the muscles, ligaments, adhesions and ankyloses, by inflation or ossicular vibration. Where swelling of the mucous membrane persists, as in hypertrophic conditions, the round cell infiltration may be absorbed as a result of the irritation. That pathogenic organisms are unfavorably affected by high temperatures, ceasing to grow at 40° C. and dying under ten minutes' exposure to 62° C.

The limit of tolerance of the membra tympani to heat applications, with ordinary air, is 67° C.

By reason of their exceptional proximity to the surface superheated air should be especially effective in the treatment of ossicular ankylosis.

In his series there was no particular selection of cases for treatment, except that those with marked nasal or nasopharyngeal abnormalities were ruled out.

At first he did not try any with a discharge or perforation in the drum;

later he found these were not contra-indications. He started treatment on a great many more cases than those outlined, but only a few were able to continue for the prescribed two months. He used the Terry electric heater, thinking it better than the smaller hand heaters; first, because the heat can be regulated more evenly, and second because it can be applied without the effort of holding with the hand.

His method of procedure was as follows: First clean the external canal of all wax and moisture, swabbing finally with alcohol; then insert tip of nozzle of heater as far as possible into the external canal after the temperature of the air douche has reached a pleasant degree of warmth, as tested by the back of hand or cheek. Care must be used not to raise the temperature too rapidly, otherwise only a moderate degree of temperature can be tolerated. A short piece of rubber tubing sufficiently small in diameter to be easily inserted into the canal about half way to the drum will insure the heated air reaching the drum before cooling. He generally used about three pounds pressure, compressed air. The treatments averaged fifteen minutes in duration.

After treatment the inner end of the external auricular canal and membrana tympani were greatly congested. This congestion had entirely disappeared forty-eight hours later. It probably lasted several hours. A small loose plug of cotton was inserted into the canal after treatment, but the patient was instructed to remove it on reaching home and not to re-insert it.

Tests with watch and tuning forks were made before and after treatments, when first seen and at the end of two months' treatment. Each patient was treated three times a week. He purposely avoided giving any other treatment, such as applications to the nasopharynx, Eustachian tube or ear, or internal medication.

Inflation by catheter was used each time after the heated air, in two cases with heated air and in the others with plain air, with no perceptible difference in results.

The immediate effects as shown by watch tests were marked, the watch being heard at double the distance after treatment.

Three tables are given showing the effects of treatment on six cases, as shown by tuning forks. Three of these were OMCC of several years' standing, two were OMCC with labyrinthine involvement, and the sixth was OMSC.

The first table shows the results after treatment at one of the early treatments; the second table shows the results before and after last treatment; the third table shows tuning fork tests before treatment, early in the treatment, and after two months' treatment. Results: three improved; three stationary.

According to the tuning forks, there had been little if any improvement. But there had been no loss, which is something, considering the progressively downward course of these cases ordinarily, and also considering the time of year of the course of treatment, namely, late winter and spring.

### *Conclusions*

1. As an exclusive treatment of middle ear disease it seems to at least arrest the course of the disease even in the most advanced cases as long as the treatment is continued.

2. As an adjunct to other methods it promises even better results.

3. In suppurative conditions it deserves further trial. It seems to dry up the secretions more quickly than the usual methods.

4. If an apparatus could be made by which the moisture in the air was eliminated, more heat could be applied and better results attained.

## HYDROTHERAPY

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### HYDROTHERAPY IN EPILEPSY

Guy Hinsdale, *Jour. A. M. A.*, January 20,  
1906

Hinsdale reviews the literature regarding hydrotherapy in the treatment of epilepsy. In this country attention was first called to its value in this disease by Dr. Simon Baruch and the late Dr. G. W. Foster of the Government Asylum for the Insane. Systematic treatment by this method is being instituted in the New York State Asylum for Epileptics at Soneyea, and the results are looked for with interest. Hinsdale believes that, as warm baths aid in the therapeutic administration of the iodids, they will also aid in the administration

of the bromids. To some extent the treatment must of course be individual, and more benefit might be expected in cases of so-called idiopathic epilepsy, alcoholic epilepsy and in cases arising from intestinal intoxication, than in focal or traumatic epilepsy. The difficulties in private practice would also be greater than in institutions, as long-continued, systematic treatment and unbounded patience will be required. Its value will be as an auxiliary method, modifying the dosage and aiding the action of the bromids. It will also be an excellent hygienic measure, favoring the action of the skin and improving the general tone of the system.

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## MECHANOTHERAPY

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### MASSAGE IN CHRONIC METRITIS AND MALPOSITIONS OF THE UTERUS

Gustav Norstrom, *N. Y. Med. Jour.*, Jan.  
27, 1906

To the practitioner in diseases of women, who is not informed as to the part that has been taken by massage in the therapy of such cases by some of the leading gynecologists of Europe, the article by Dr. Norstrom will seem to partake more of the hopefulness of an enthusiast than of the established knowledge of the scientist. But to the practitioner who has observed the trend of treatment since the day when Thure Brandt taught by both precept and example this application of medical gymnastics there is nothing revolutionary or even startling in this exposé of a method that has been practised for over a

quarter of a century.

The tendency to coarse and sometimes vulgar criticism of this method has passed away, and the profession is now ready to inquire as to the success of this treatment, and as an answer to this inquiry the paper before us will have much weight.

The seeker for the methodology of the followers of Brandt will find a complete description of the practice in "Kinesitherapie Gynecologique" published by Stapfer in Paris in 1897. A less complete description of the technique was published by M. Boucart in Paris in 1898 in connection with his translation of Wide's "Medical Gymnastics."

Norstrom in the present article emphasizes the frequency and importance of parenchymatous metritis, and claims that the only primary endometritis is of

bacterial origin, and he also teaches a physiological fact, that is so often overlooked, when he insists upon the value of muscular contractions in helping on the flow of blood toward the heart.

In all muscular structures and especially the uterus the relief from vascular congestion is to be found in the contractile waves that are almost continuous in that viscus in conditions of health, and that are often weak and inefficient in abnormal states. This may result in the hemorrhages that are likely to prolong the menstrual epoch so that with shortening of the periods of intermenstrual relief there will be almost continual loss of blood with resulting anemia and asthenia.

In such cases the first treatments are likely to produce increase of the hemorrhage from the pressing out of blood from the uterine cavity and from the stimulation of the circulation, but the reaction is sure to result in an amelioration of the hemorrhagic flow and a gradual return toward normality.

In leucorrhea due to cervical catarrh this form of treatment offers greater advantages than curettment, both theoretically and practically, for the mucous glands are at fault and cannot be reached by even deep erosion of the surface, for

the follicles penetrate deeply into the muscular tissue.

In cases of sterility due to metritis this form of treatment has been found efficacious. It is not material whether the metritis causes a hypersecretion of viscid mucus or the discharge is fetid, showing bacterial invasion, for the establishment of a proper circulation by massage may properly be made the first step in treatment.

In cases of atresia and malposition the author does not consider that the obstacle to pregnancy is insurmountable, for any opening large enough to accommodate the menstrual flow will permit the entrance of spermatozoa, and if inflammatory conditions are relieved impregnation may follow.

In the cases of reflex irritability of the bladder due to metritis, as so many of them are, massage will give the needed relief as it will in cases of constipation that are often due to this reflex disturbance of innervation. Where there is disturbance from malposition the manipulation should restore to the normal or at least secure a relief of the congestion which seems to be the cause of the pain and many disturbances of function.

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Third, the contributor's name and postoffice address, a description of the subject of the skiagraph and full details as to the technique employed in its production, character, make, and size of exciting apparatus and tube, distance of anode from plate, time period of exposure, whether or not intensifying screen, diaphragm, or compression was used, make of photographic plate, and composition of developer, shall be recorded plainly upon a piece of paper accompanying, but detachable from the skiagraph. The skiographs will be numbered to correspond with these records so that the judges will render their decisions by the number of the skiagraph, and the maker's name will be made public only after the winner is announced.

Fourth, three dollars for one year's subscription to the ARCHIVES shall accompany each skiagraph submitted.

### THE JUDGES ARE AS FOLLOWS:

DR. HENRY HULST, GRAND RAPIDS, MICH.,

*President of the American Roentgen Ray Society.*

DR. ENNION G. WILLIAMS, RICHMOND, VA.,

*Professor of Pathology in the Medical College of Virginia.*

DR. EUGENE WILSON CALDWELL, NEW YORK CITY,

*Director of the Edward N. Gibbs X-ray Laboratory, University and Bellevue Hospital Medical College, New York.*

DR. PRESTON M. HICKEY, DETROIT, MICH.,

*Radiographer to the Children's Free Hospital of Detroit.*

DR. MIBRAN K. KASSABIAN, PHILADELPHIA, PA.,

*Director of the Roentgen Ray Laboratory of the Philadelphia Hospital.*

The selection of the winner will be determined by (1), skiagraphic excellence, (2), diagnostic utility.

As soon as these gentlemen have reached a decision a check for Fifty Dollars will be forwarded to the successful contestant, and the winning contribution will be published in our next issue.

All skiographs to be entered for this contest should be sent to Dr. C. E. Skinner, 67 Grove Street, New Haven, Conn., so as to arrive there not later than midnight of April 30, 1906. *Note carefully the conditions laid down*, as failure to fulfil *any one of them* will cause the skiagraph to be rejected at once.

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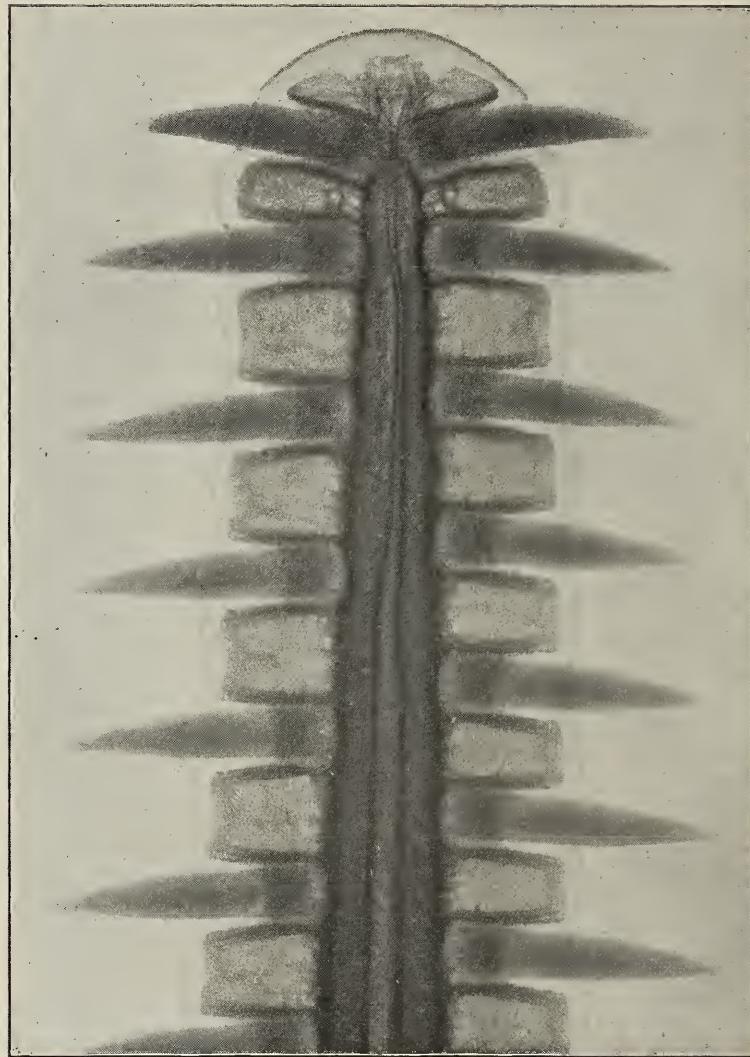
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APRIL, 1906

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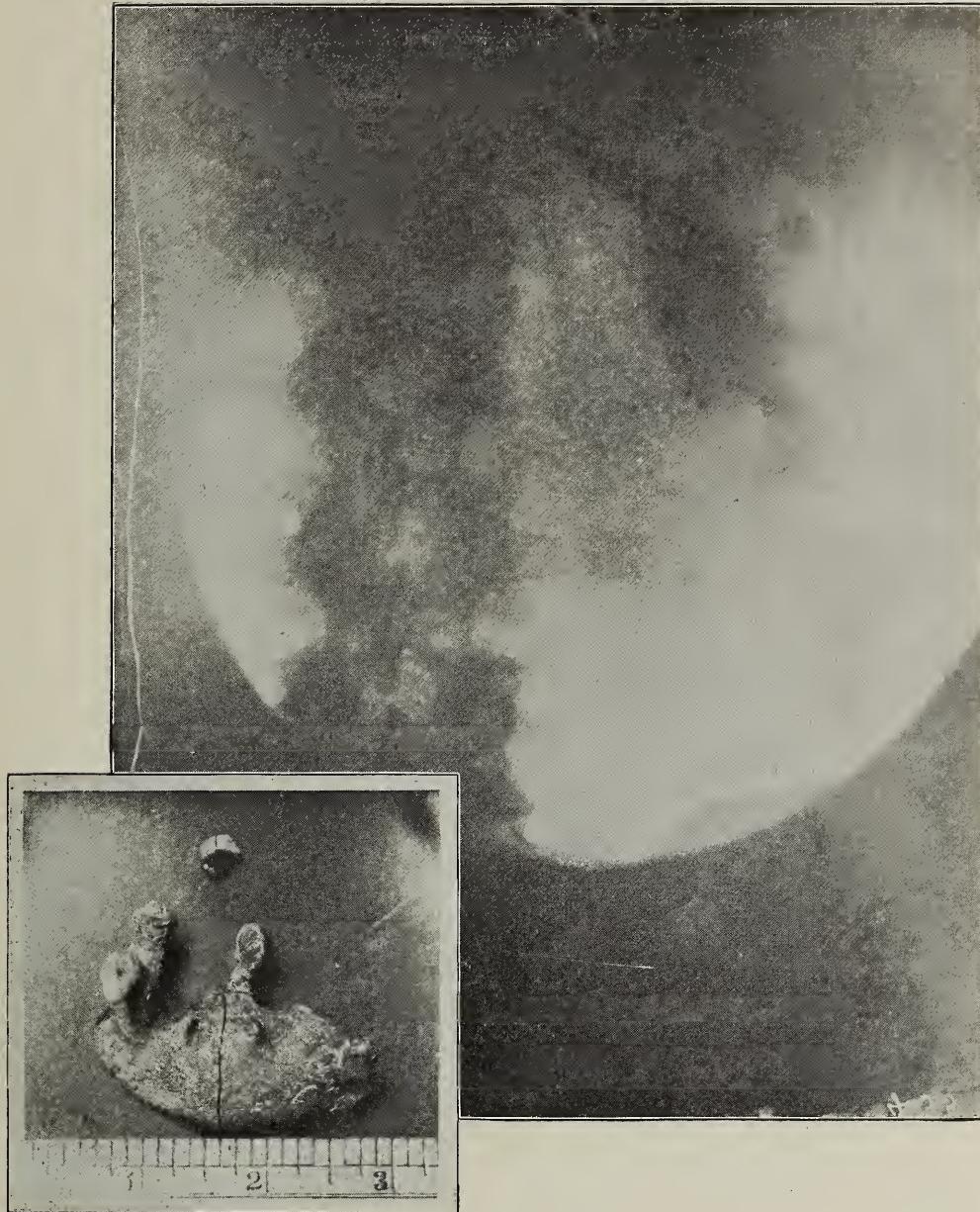


SPECIAL PLATE L.—END OF SAW OF A  
20-FOOT SAW FISH

The fish was captured by Dr. A. R. Stubbs in the Gulf of Mexico near Coatzacoalcos.

Made with a Gundelach tube located 18 inches from the plate, excited by an 8-inch coil with electrolytic interrupter, three seconds exposure.

By Dr. E. W. Caldwell, of New York City.



#### SPECIAL PLATE LI.—RENAL CALCULUS

The diagnosis in this case depended entirely upon the skiagraph as a slight pyuria was the only symptom. A photograph of the calculus after removal is shown in the lower left-hand corner.

Made with a low tube excited by a 12-inch coil with electrolytic interrupter, compression blonde, using 20 amperes of primary current, 45 seconds' exposure.

By Dr. H. W. Van Allen, Springfield, Massachusetts.



#### SPECIAL PLATE LII.—VESICAL CALCULUS

Photograph of the calculus after removal is shown in the upper left-hand corner.

Made with a low tube excited by a 12-inch coil with electrolytic interrupter, compression blende, 20 amperes primary current, 30 seconds' exposure.

By Dr. H. W. Van Allen, Springfield, Massachusetts.

# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

*Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.*

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APRIL, 1906

WHOLE NUMBER XV

## LATE RESULTS OF THE X-RAY TREATMENT OF SARCOMA\*

BY WILLIAM B. COLEY, M.D., OF NEW YORK CITY

*Attending Surgeon at the General Memorial Hospital, Associate Surgeon at the Hospital for Ruptured and Crippled, New York City*

Inasmuch as I have only very recently, in a paper read before the New York Surgical Society, reported the final results of our work at the General Memorial Hospital with the X-ray in malignant tumors, including sarcoma, you will pardon me if some of the things I shall say today are a repetition of that paper. (Annals of Surgery, August, 1905.)

I have been deeply interested in the subject of sarcoma for many years, and when the X-ray began to be used for malignant disease about four years ago, I had an exceptional opportunity to try the method upon sarcoma. The results of this trial extending over a period of nearly four years, as well as the results of the method in the hands of other men, I shall endeavor very briefly to set before you.

During the past three and a half years we have observed sixty-eight cases of sarcoma treated by means of the X-ray. In seventeen the head and face were the

seat of the disease; in thirteen the neck and shoulder; in ten the lower extremities; in two the upper extremities; the chest wall and pectoral region in four; the back in four; the abdomen in six; the testes in five; the ovaries in three; four occurred in other parts of the body. A few of these cases were treated by myself personally; the majority, however, were treated at the General Memorial Hospital by Mr. W. P. Agnew and Dr. James Oglevie under my direction. These cases represent practically every type of sarcoma.

In six of the sixty-eight cases complete disappearance was observed, but in every one of them there was a recurrence within a few months from the time of the disappearance of the disease. In two of these cases the recurrent growths subsequently disappeared when injections of the mixed toxins of erysipelas and bacillus prodigiosus were added to the X-ray treatment. These two cases are still well at present, one nearly two

\* Read at the Sixth Annual Meeting of the American Roentgen Ray Society at Baltimore, Md., September 28-30, 1905.

and a half years, the other one year after the disappearance of the last recurrent growth. They are of sufficient importance to merit a brief description:

**Case I.—Small Round-celled Sarcoma of the Back.**

W. J., aged eleven years. Family history good. Toward the end of August, 1901, the patient fell from a stoop, striking on his back. Two or three weeks later a soft, fluctuating swelling appeared in the mid-scapular region and increased rapidly in size. The patient was referred to me in December, 1901, by Dr. Polhemus, of Nyack, N. Y. Physical examination at that time showed a cystic swelling the size of an orange in the left scapular region, situated apparently just beneath the skin and superficial fascia.

On January 12, 1902, an incision was made under ether and several ounces of dark blood evacuated. The wound closed without drainage by primary union. About three weeks later a tumor began to develop at the site of the former swelling. This grew rapidly, and when I operated again in May, I found in addition to blood clots a very suspicious thickening of the walls of the cyst. Microscopical examination of the thickened tissue made by Dr. H. T. Brooks of the Post-Graduate Hospital, proved it round-celled sarcoma of high vascularity.

The X-ray treatment was begun two weeks after operation, before the wound had entirely healed, and was kept up steadily. Despite the treatment a local recurrence set in in December, 1902. This increased in size, so that in January I felt called upon to operate for the third time. I removed the recurrent tumor together with the old cicatrix.

Although the X-ray treatments were

promptly resumed and continued regularly once or twice a week, signs of another recurrence became apparent in June, 1904. In addition to the X-ray I then began local injections of the mixed toxins of erysipelas and bacillus prodigiosus two or three times a week, with the result that the recurrent growth slowly disappeared, the ulcerated area healed over, and by the end of June, 1905, there being no trace of a growth anywhere discernible, the treatment was discontinued. The boy is at present in perfect health.

**Case II.—Round-celled Sarcoma of the Femur Involving the Lower Two-thirds of the Shaft.**

A. G., nineteen years of age, first noticed a swelling in the lower portion of the femur in November, 1901. This increased in size and at the time of my first examination, February 5, 1902, extended from the condyles of the left femur to the junction of the middle and upper thirds. There was a fusiform enlargement of the entire lower two-thirds of the femur and slight impairment of the functions of the joint itself. An incision was made under ether into the swelling, and two or three ounces of clear serum withdrawn. A curette was passed into the cavity of the bone and typically sarcomatous tissue removed, which on microscopical examination by Dr. E. K. Dunham proved to be round-celled sarcoma.

Amputation at the hip was advised but absolutely refused. The X-ray treatment was begun entirely as an experiment. At the end of four weeks the circumference of the tumor had decreased an inch. Upon discontinuing the treatment for two weeks the tumor again increased to nearly its former size. The X-rays were resumed and by the

end of December, 1902, the measurements of both legs were equal, although there was still some thickening in the lower part of the femur. The old sinus, which had never healed after the exploratory incision, was enlarged under ether and carefully curetted. Examination of the tissues failed to show any trace of sarcoma. The patient had gained twenty pounds in weight.

Nevertheless, toward the end of December, 1902, a metastatic tumor, very soft and vascular, began to develop in the pectoral region; it grew rapidly and when it reached the size of a hand, was removed. A little later a tumor the size of a child's head developed in the right iliac fossa extending from the costal cartilages down to the pelvis.

In addition to the local treatments with the X-ray in the femoral and pectoral regions, I then began the use of the mixed toxins of erysipelas and bacillus prodigiosus. A few weeks later the large tumor in the ilio-lumbar region began to soften and break down, and on becoming completely fluctuating was opened posteriorly. A large amount of necrotic tumor tissue was evacuated and the sinus drained for about a year. At the present time, nearly two and a half years later, the boy is apparently in perfect health, except that the sinus in the leg and the thickening of the bone have persisted. There is absolutely no evidence of sarcoma to be found.

Two of the remaining four cases in which the tumor completely disappeared have since died, one of internal, the other of general metastases; in the third a fatal issue is expected at any moment; the fourth is still living with a recurrence that has not yielded to the combined X-ray and toxin treatment, although there has been great improvement.

A brief résumé of the histories of these cases may be of interest:

**Case III.** — *Extensive Recurrent Round-cell Sarcoma of the Neck, both Sides, Supra and Infra-clavicular, Pectoral and Axillary Regions on One Side, and Mediastinal Glands.*

The patient, M. A., forty-five years of age, was in such a hopeless condition that she was not expected to live more than two months. The mixed toxins had been used with improvement at first, but later ceased to have any influence upon the disease. In February, 1902, I began the X-ray treatment purely as an experiment, but the improvement was most striking and rapid. Within a few months the tumors had completely disappeared, the last nodule having been removed under ether for pathological examination which confirmed the original diagnosis. The patient regained her normal strength and spent the summer in the country.

When she returned by the end of September, there was local as well as metastatic recurrence. These recurrent growths again yielded to the X-ray treatment which was promptly resumed; but the improvement was not permanent. The patient remained under X-ray treatment and was in fairly good health up to the early part of 1904, when her general health became deteriorated and she died in January, 1904, or about three years after she had been given up to die.

**Case IV.** — *Small Round-celled Sarcoma of the Pectoral Region.*

E. M., aged thirty-five years; had been twice operated upon for sarcoma of the right pectoral region by Dr. Maurice H. Richardson, of Boston, and a microscopic examination made by Dr. W. F. Whitney at the Massachusetts General

Hospital proved the growth to be round-celled sarcoma. The last operation was performed in October, 1901. The disease then involved the pectoral and axillary regions so widely that it was impossible to make a complete removal. The patient was referred to me by Dr. Richardson in October, 1901.

Under the treatment with mixed toxins the tumor softened, and in January, 1902, a spontaneous opening occurred with evacuation of about a pint of necrosed tissue. In February, 1902, the X-rays were added to the toxins, causing continued decrease in the size of the tumor. In June, 1902, the growth had entirely disappeared, and the patient had gained twenty pounds in weight.

In January, 1903, a small movable nodule in the pectoral region was discovered. This disappeared under six weeks' treatment with the mixed toxins and X-rays. In December, 1903, he had another slight local recurrence, which again yielded to the combined X-ray and toxin treatment. The patient remained well until the early part of 1904, when he had a local return which never entirely disappeared, although he remained in good general health up to the end of May, 1905.

Physical examination on July 5, 1905, showed an extensive local recurrence and evidence of extension of the disease into the lung and pleura. He was much emaciated and died September 17, 1905.

**Case V.—Inoperable Round-celled Sarcoma of the Chest Wall Involving Ribs, Treated by the X-rays Combined with the Toxins of Erysipelas and Bacillus Prodigiosus.**

G. C., sixteen years old, enjoyed good health up to 1903, when he had an attack of what was considered pleurisy with effusion. He was aspirated, but the

dulness over the chest persisted, and he rapidly lost flesh and strength. In October, 1903, he entered the Johns Hopkins Hospital where he was operated upon for supposed empyema. A large incision was made showing necrosis of the eighth and ninth ribs, and behind these some gelatinous masses were found. These were partially removed and examination by Dr. Welch proved them to be round-celled sarcoma.

The patient was referred to me on May 26, 1904, and placed under the combined toxin and X-ray treatment at the General Memorial Hospital for two months. The improvement was very rapid, and when the patient left the hospital in the fall of 1904, there was no trace of the tumor left. He had gained twenty-five pounds in weight and seemed in perfect health. The toxin treatment was continued by his family physician at his home in Canada.

By the end of January, 1905, the patient returned to New York with a local recurrence which, although showing slight improvement at first, soon began to increase in size despite large doses of the toxins plus regular X-ray treatment. After a thorough curettage in March and again in June, the patient was sent home, his condition being hopeless.

**Case VI.—Inoperable Intra-abdominal Sarcoma Involving Mesentery, Mesenteric Glands, and a Portion of the Small Intestine.**

Mrs. W. was operated upon in November, 1903, by Dr. Wm. M. Conant, of Boston, for abdominal tumor. It was thought to be connected with the uterus or ovary, but an infiltration into the small intestine was found. There was also in the posterior peritoneal part of the mesentery a growth fully as large as

the closed fist. The growth was so extensive and suspicious that no attempt was made to remove it. Pathological examinations made by Drs. W. F. Whitney and A. C. Potter proved the disease to be round-celled sarcoma.

The patient was then referred to me by Dr. Conant, and I placed her under the mixed toxin and X-ray treatment. The tumor entirely disappeared within four months' time. A little later the patient developed high temperature with acute abdominal symptoms, pointing to local peritonitis. She was seriously ill and it was thought she would not survive the attack. A faecal fistula finally developed and she slowly recovered her health, remaining free from recurrence until January, 1905, when a small mass was detected in the lower portion of the abdomen, at the site of the original tumor. The treatment was resumed by her former physician, Dr. W. E. Wilson, of Pawtucket, and although the growth has not disappeared, there has been improvement.

In the great majority of cases little or no effect upon the sarcoma was noticed, although the treatment was pushed to extreme limits. A few cases, however, are worthy of special note :

One case, a very rapidly growing sarcoma of the orbit with extensive involvement of the lymphatic glands of the neck showed marked improvement almost immediately after beginning the exposures to the X-ray. The glands of the neck almost entirely disappeared under three or four weeks' treatment, and the tumor of the orbit showed considerable decrease in size. The improvement was very temporary, however. The tumor soon began to increase rapidly in spite of continuous treatment, causing death about three months later.

I have used the X-ray upon three cases

of melanotic sarcoma originating in the skin about the ankle, and in two cases involving the femur and iliac glands. In one of these, a rather slow growth, upon which four or five operations had been previously performed, and which, at the time when the X-ray treatment was begun, showed marked involvement of the iliac glands, the disease seems to have been arrested and life much prolonged, the patient remaining fairly comfortable for nearly two years, when death ensued. In the other two cases the treatment showed absolutely no effect upon the small nodules in the skin about the ankle nor upon the deep-seated glands in one of these cases.

In my efforts to trace to final results certain reported successful cases of deep-seated malignant tumors treated by other men, I have found the following :

**Case I.** — *Round-celled Sarcoma of the Neck, Treated by Dr. C. E. Skinner, of New Haven, and Published by Dr. Frank A. Kirby (Journal of Advanced Therapeutics, February, 1902).*

The patient, male, aged sixty-four years, in 1899 received a blow upon the neck from a wagon-pole, leaving a contusion which lasted about a week. Two months later a swelling was noticed at the site of the injury. This grew very slowly for about sixteen months, when the patient severely wrenched his neck. Almost immediately afterwards the tumor began to grow more rapidly and became painful. By November, 1901, it had become very large, occupying the greater portion of the left mastoid and cervical region. Microscopical examination by Dr. Archibald McNeil, of the New Haven Board of Health, showed the growth to be round-celled sarcoma. The X-ray treatment was begun on November 20, 1901, by Dr. Skinner, who

states that, in the incredibly short space of time of six weeks, the patient was apparently cured, the tumor having disappeared and the patient being free from pain and able to resume his work.

On June 27, 1902, I made a personal examination of this case and found absolutely no trace of a recurrent growth in the left side of the neck and mastoid region. In the lower part of the cervical region, however, I detected on deep pressure a very slight enlargement of one or two of the deep cervical glands.

In a letter received in the latter part of 1903, the patient's physician stated that he began to lose rapidly in general health, and died about five months later. While no autopsy was made, there is little doubt that his death was due to internal metastases.

**Case II.—*Small Round-celled Sarcoma of the Neck, six times recurrent and apparently absolutely hopeless, in a man seventy years of age.***

The X-ray treatment was begun by Dr. E. R. Fiske, of Brooklyn, on December 22, 1901. The treatment was continued for a year, with occasional intervals of rest. At the X-ray meeting of the Academy of Medicine, on March 9, 1902, I showed the patient in perfect health, there being not the slightest suspicion of a tumor or induration in the neck.

On January 23, 1903, I learned from Dr. Fiske, that the patient was free from recurrence, in excellent health, and had gained in weight. Less than a year after this, I received a letter in which it was stated that the patient had died on September 23, 1903, under symptoms of cerebral thrombosis. Here again there is a strong probability that death was due to generalization of the disease.

Similar to the foregoing has been the

usual course of nearly all the primarily apparently successful cases that have come to my notice. The only exception to this rule of recurrence after X-ray treatment may possibly be found in the case of large fibrosarcoma of the abdomen treated by Skinner. The history of this case is so remarkable that it merits a brief *résumé*:

M. G. H., female, thirty-four years old, was referred to me by Dr. Maurice H. Richardson, of Boston, on April 19, 1901. She had been operated upon three years before for what was supposed to be fibroadenoma of the uterus; tubes and ovaries were removed. No microscopical examination was made. Two months prior to her coming to me, she had noticed a large tumor in the lower part of the abdomen in the region of the cicatrix. Physical examination at that time showed a tumor the size of a cocoanut in the lower part of the abdomen, filling up the entire iliac fossa, extending nearly to the umbilicus, two inches beyond the median line to the left. The tumor was firmly fixed and seemed to involve the abdominal wall. An incision was made under cocaine, and a portion of the growth, which infiltrated all the muscles of the abdominal wall, was removed and on microscopical examination proved to be fibrosarcoma.

I used the erysipelas and bacillus prodigiosus toxins more or less constantly until January, 1902, at first with marked diminution in the size of the tumor, but later with very little effect, and, finally, the tumor began to grow in size very rapidly. I regarded the case as entirely hopeless. The patient had lost much weight and had begun to be cachetic.

The X-ray treatment was begun by Dr. Clarence E. Skinner, of New Haven, on January 28, 1902. Forty-six applications were given up to June 5, by

which time the lateral circumference of the tumor had increased from thirteen and three-fourths to fifteen inches. She had had several attacks of fever lasting for a few days, with symptoms of toxæmia, probably from absorption. Her general health, however, improved considerably during this time.

From June to September she received thirty-one treatments, and during this time there was so much local and general improvement that she decided to resume her work as a school-teacher. Up to April 25, 1903, or two hundred thirty-four days, she received forty-six treatments, or about one treatment in five days. There was a marked decrease in the size of the tumor. From April 25 to August 29, 1903, she received only eight treatments, or one every two weeks. She had gained eleven pounds since the beginning of the treatment. From August, 1903, till May 20, 1904, she received only five treatments, or one every thirty-seven days. By this time her weight had increased to one hundred forty-seven pounds, being nineteen pounds more than in the beginning, and the tumor had entirely disappeared.

In July, 1904, I examined the patient and *was unable to detect any evidence of a tumor*. The entire period of treatment extended over eight hundred forty-nine days, during which time one hundred thirty-six treatments were given.

While it is true that only eighteen months have elapsed since the cessation of the treatment and disappearance of the tumor, it is nevertheless the most remarkable case on record, I think, considering the very large size of the growth and its deep-seated location, although, of course, it is quite too soon to consider it a cure.

In a letter dated June 4, 1905, the patient states that she is in perfect

health, and has had no return of the tumor.

The use of the X-ray as a pre-operative measure in primary malignant tumors, has been strongly advocated by some, especially Morton, of New York. The reason advanced in support of this plan is, that the previous X-ray treatment clears up the field of operation, in that it causes decrease in the size of the tumor itself, and often subsidence or disappearance of the outlying glands. If, at the end of a few weeks' treatment, the tumor has not disappeared, it is argued that an operation of lesser magnitude, or one under more favorable conditions can be performed, than would otherwise have been the case.

My opinion is that this pre-operative use of the X-rays in primary operable malignant tumors, particularly in sarcoma, is a very dangerous practice. The objection to it, which I have already pointed out in an earlier paper is, briefly, that the method rests upon two false assumptions, as follows:

First, it presupposes that we are dealing with a *curative* agent; second, it takes for granted that no harm can come to the patient during these weeks of treatment.

The facts up to the present moment fail to show that the X-rays are curative of malignant tumors in any other form than the small, superficial epitheliomas. In deep-seated cancer, including sarcoma, there have been very few cases in which the tumors have disappeared entirely and, as far as I am able to judge, not only from personal experience, but also from a very careful study of the literature of the reported cases, no patient has remained free from a local or general recurrence for a period of three years, the shortest time required to justify us in considering a case a cure.

Another grave danger from putting off operation until the X-ray has been first tried, is the possibility of generalization of the disease either by the treatment itself, or coincidentally with the same. Personally I have observed a number of cases of primary or recurrent cancer of the breast become much smaller under the X-ray treatment and, in a few instances, the tumor apparently disappeared altogether; yet, at this very time the disease was insidiously extending into the neighboring glandular areas, or was being carried by the circulation into the general system, causing metastases. In some of these cases the extension was so unusually rapid, that I have become convinced that the breaking-down of tumor tissue which occurs before absorption takes place, not infrequently permits infected cells to get into the circulation, giving rise to general dissemination of the disease. I have already given brief histories of two of the cases which helped to confirm my belief; one was a lympho-sarcoma of the neck, the type of tumor in which general dissemination is rarely found. Yet in this case, almost immediately after the disappearance of large tumor masses in the neck and cervical region, there appeared large tumors in the groin and in the retro-peritoneal glands. Finally, just before death, hundreds of tumors developed subcutaneously in almost every portion of the body.

In another case, a round-celled sarcoma of the femur, while the primary tumor was diminishing in size, there developed a large metastatic growth in the left pectoral region and almost simultaneously a large tumor, the size of a child's head, in the right retro-peritoneal region.

The value of X-ray as a prophylactic after operation for primary sarcoma

is, I believe, as yet undetermined. In a number of cases, both of sarcoma and carcinoma, I have used the X-rays immediately after primary operation with the hope of preventing a return. In nearly all of these cases, however, a recurrence has taken place early, and small, almost imperceptible nodules have grown apparently quite as rapidly under the exposures to the X-rays, as if no treatment had been used.

It would require a much larger number of cases and much more data as regards the character of the tumor and the period of observation, than we have at present, to render justifiable the expression of any authoritative opinion upon this point.

My own feeling, based upon my experience thus far, is that there is not sufficient evidence to justify us in advocating X-ray treatment as a routine measure after primary operations for either sarcoma or carcinoma. As a further factor in support of this opinion might be mentioned the danger of the X-rays themselves producing cancer in normal tissue. That such a result may take place is evidenced by at least four cases in which cancer has developed in the hands of X-ray workers.

### *Conclusions.*

The results of the treatment of sarcoma with the X-rays thus far have shown :

First, that the great majority of cases are but little affected by the use of the X-rays.

Second, that in a certain small proportion of cases the tumor decreases rapidly in size and, in a few instances, may totally disappear.

Third, that in all of the cases so far observed, with one exception, there has been either local or general recurrence,

although in some few cases life has undoubtedly been considerably prolonged.

Fourth, the very small percentage of cases in which the tumor has disappeared and the almost universal tendency to early recurrence even in these cases, added to the danger of possible dissemination because of the treatment itself, are sufficient reasons for never advocating the method except in inoperable or recurrent cases.

Fifth, the facts thus far furnish no evidence that the X-ray has any prophylactic value when used after primary operation.

#### *Discussion.*

Dr. G. G. Burdick (Chicago) stated that his results in the treatment of sarcoma with the Roentgen ray had been much more satisfactory than those obtained by Dr. Coley. He has found that tubes that are thickly coated with aluminum on the inside are much more effective than those that are not. It is also essential not to irritate the tissues. Slow, persistent radiation is needed, and a tube so thoroughly protected that no soft rays go through to the tissue.

Dr. Bowen (Columbus, O.) cited a case of recurrent sarcoma of the sternum that recurred after operation but yielded promptly to a six months' course of X-ray treatment. There has been no recurrence in three and a half years. He used an old tube with high penetrative power. He also used Coley's serum, but not with any degree of success.

Dr. J. Rudis-Jicinsky (Cedar Rapids) has used Coley's toxins, and believes that they were instrumental in bringing

about a recurrence of the sarcoma. He has obtained satisfactory results by raying both before and after operation in these cases.

Dr. Stevens (Detroit) treated a case of recurrent sarcoma, using a Gundelach tube excited by a twelve-inch coil, that disappeared entirely in three months. Similar results were obtained in a case of multiple sarcomata of the skin occurring in a man seventy-two years of age. He believed that with improvement in technic it will be possible to obtain equally satisfactory results in the case of deep-seated tumors.

Dr. M. K. Kassabian (Philadelphia) cited a case of sarcoma on the leg that recurred after Roentgen ray treatment, the recurrence taking place not in the site of the original tumor, but in a spot that had not been exposed to the ray near the margin of the first tumor. He advised exposing an area three or four times the size of the one involved when giving post-operative treatment.

Dr. J. J. Willey (Ann Arbor, Mich.) treats his patients for two to four weeks prior to operation, using a hard old tube, and with fairly good results. One case cited recovered entirely after forty-two treatments.

Dr. George C. Johnston (Pittsburg) has three cases of inoperable sarcoma alive and well three years after treatment was stopped. He believes, however, that the results of treatment depend largely on the degree of malignancy of the tumor. He said that with a combination of the toxins and the Roentgen ray much good can be done.

## THE TECHNIQUE OF THE ROENTGEN TREATMENT OF KELOIDS.\*

BY O. SHEPARD BARNUM, M.D., OF LOS ANGELES, CALIFORNIA.

SINCE the successful light-ray treatment of keloids differs materially from that of the majority of skin lesions, I consider a clear picture of the condition necessary as preliminary to a discussion of technique in treatment.

In keloid we have a structure, in my opinion, unusually susceptible to the inhibitive properties of the Roentgen ray. Pathologically it is a fibrous new growth of the corium, more or less elevated above the skin, generally pink in color and firm to the touch. It is smooth and shining, and tortuous blood vessels can usually be discerned near its surface. The tumor is made up of bundles of connective tissue lying longitudinally with its longest diameter, nuclei and spindle cells being grouped about the blood vessels. At various points processes diverge which dip down into the surrounding skin, and in this way a considerable territory may eventually become affected in the same degenerative way. By the progress of these processes the overlying cuticle is sometimes drawn out over the adjacent healthy skin like a hood thus forming pockets to the depth of half an inch or even more. The lymphatics are not involved.

The essence of the lesion is a debility and degradation of normal cellular processes, — the displacement of highly organized corium by a non-vascular, white, fibrinous structure. In very rare instances it may progress to sup-

purative or even malignant degeneration. It is a question whether there are any idiopathic cases of keloid. I personally doubt if every case is not traumatic, — the original trauma being so slight in many instances as to be entirely overlooked. Although we do find the disease apparently sequential to smallpox, eczema, and boils, yet the vast majority result from surgical operations, burns, scalds or flogging. The negro race is especially susceptible to these growths. Pain is present in a large majority of cases, variously described as itching, burning, smarting, lancinating, and stinging.

Differential diagnosis is necessary from hypertrophied scar, but the distinction is not of very great importance to us in considering the therapy of the Roentgen ray in these lesions, since under the ray the results seem to be nearly identical. A rather extended experience leads me to say that the only difference manifest is a slightly greater stubbornness of a true keloid to answer to treatment.

It goes without saying that the length of time for successful treatment, (together with slight modifications of the same), are greatly influenced by the extent of the lesion. This fact in itself makes prognosis less favorable for quick results in keloid, since hypertrophied scar never encroaches on tissue beyond the line of surgical incision or suture-holes; while keloids may in time involve considerable surface, although the original was but a point. In one instance that came under my eye, the total area

\*Read at the Sixth Annual Meeting of the American Roentgen Ray Society at Baltimore, Md., September 28-30, 1905.

affected amounted to eighty-four square inches on the back. Any part of the body may be attacked, but a majority of keloids are found over the sternum.

We have, therefore, to combat a retrogressive cell development, non-vascular compared with normal, fibrinous and, safe to say, without malignant tendency. Our object, in brief, is to inhibit the degenerative cell development, stimulate normal tissue processes and promote absorption. It is not only unnecessary, but unwise to use the ray in these cases to the necrotic stage of the rayed part, and herein lies the difference between keloid and cancer under Roentgen ray. In superficial epithelioma, for instance, we seek to cause a complete destruction of the malignant cells and promote sloughing. In this benign tumor we seek to stimulate normal cell development with its concomitant increase of lymphatic and venous circulation, thus leading to the absorption of abnormal tissue. Whether this process is aided by a fatty or granular degenerative change in the fibrinous keloid (a claim made by some pathologists) or whether the process is but analogous to the absorption of any simple infiltration of normal structure, I do not venture to say. The latter is a tenable theory since we can well believe that atrophy, or cell inanition, follows the inhibitive action of the ray on the degraded tissue, and absorption naturally follows.

We all recognize the following factors in the equation of Roentgen ray therapy in each individual case :

Source of electrical energy.

Apparatus for exciting the tube.

Construction and vacuity of tube.

Abundance of the rays.

Time of exposure.

Distance of tube from lesion.

Idiosyncrasy of patient.

Of these the last can be almost entirely eliminated in treating keloids in the way I outline, since necrosis, or even dermatitis, is not necessary, and the tube is far enough away and the ray penetrating enough to prevent any superficial inflammatory changes. In some instances I have gone far enough to produce slight tanning of the healthy skin surrounding, but do not consider even that necessary.

As to the other factors. In general terms I advise a very great abundance of the rays from a tube of rather high resistance and excited by a large coil. I have no doubt we have all concluded that each and every one of the factors above enumerated should be as nearly as possible constant quantities, and this matter is worthy of great emphasis. I believe many reported failures in ray therapy are due to the faulty habit of the operator of changing exciting apparatus and tubes as the whim may dictate. These two at least should be constant in any one case. Given a good coil, and a tube somewhere near suited to the individual case, and a proper adjustment of time and distance will accomplish all the variation necessary to successful use. I consider that the large variety of apparatus, — coils, tubes, shields, and what-not, such as my office affords, serves only to simplify and accelerate the work, and I venture to say almost equally good results could be obtained with but one sized coil and one tube, by proper adjustment of the same to each case.

To aid our discussion of technic let us take an hypothetical case, — its prototype unfortunately too common.

Given a keloid on the sternum, say six inches long, one inch wide, one-half inch high, what are the essentials for treatment and what are the results?

*I. Apparatus capable of generating abundant rays in tube.*

Any tube properly excited will generate *abundant* rays. The truth of the remark we used to hear that "a coil will cause a burn much quicker than a static" was due to the abundance of the rays. Amperage seems to be necessary in the primary of the coil, the amount to properly excite a given tube depending on the size of the coil.

Three amperes will do as much in an eighteen-inch coil as eight amperes in a twelve-inch coil. Abundant rays mean good penetration and good differentiation, and the tube should be closely watched and current increased as necessary to keep the proper steady glow. As the rheostat becomes heated during treatment its resistance increases and more current must be allowed to pass.

*2. Rather high tube, at least six inches in diameter.*

The terms high and low tubes are too ambiguous to be of much use to us in describing them. What I mean here by rather high tube is one with considerable penetration which does not lack good definition. To differentiate between tubes a gradient of ray penetration must be used for comparison. I style the ray I use in keloid as a moderately *long ray*, *i. e.*, one which will give me the bones of the hand at twelve feet distance, or the densest part of my gradient at four feet. It is better to have a tube too high than too low for this kind of work.

*3. Distance fifteen to twenty inches from the lesion.*

The variation in distance from the tumor depends upon its thickness. The deeper the affected tissue the higher the tube, the greater the distance from the tumor, and the longer the exposure.

*4. Exposure fifteen to twenty-five minutes on alternate days, for eight to ten treatments.*

Then rest ten days, or until you are convinced that there will be no dermatitis, then repeat the process. Continue similar series until the tumor is quite disappeared, — possibly three to six months, then make exposure for less time or less frequently until the last vestige of the lesion disappears and the desired cosmetic effects are secured.

I have three cases in mind illustrative of this method of procedure, briefly described as follows :

Let it be understood that every case is diagnosed by at least one physician beside myself and verified by microscopical examination, slides being preserved as part of the record.

1. Keloid over sternum following excision of breast for sarcoma. It measured six inches long, one and a half inches wide, and about one-half inch high. Its growth was rapid and pain constant and severe. One hundred and twelve treatments were given, covering a period of sixteen months, with complete removal of the tumor and no return to date — a period of three years. In this case, as in all others, pain was eliminated almost at once, one result we may always expect.

2. Keloid over sternum of ambiguous origin, in measurement very similar to No. 1. This tumor had been removed by knife twice, returning in each instance in a few weeks in a much more

active form. Ninety treatments were given with steady reduction of size and final cure in a few months.

3. Keloid involving entire right side of face following alcohol explosion. This was the worst case I ever treated and results were eminently successful. The process was somewhat slower than others, owing to more conservative treatment, but the redness quickly paled, tumors softened (they reached from the hair nearly to the clavicle) and absorption was apparent after thirty days' treatment. Eighty-seven rayings in all were made within a period of eighteen months, and at present, one year after cessation of rayings, there is normal color of skin and no signs of tumors whatever. Some lines of the old scar are visible when closely inspected, but at a little distance there is no difference noticeable in the two sides of the face.

My conclusion, based on successes like the above and with no failures, is that we are at liberty to prognose very favorably in treatment of hypertrophied scar and keloid by the Roentgen ray. Perhaps the entire matter of treatment might be summed up in the following general rules :

Select the most suitable apparatus available and stick to that.

At the slightest reaction on the healthy skin cease treatments until it fully subsides.

Do not ray too fast.  
Do not ray too far.  
Persevere.

#### *Discussion.*

Dr. H. K. Pancoast (Philadelphia) said that experience has taught him that by first excising the tumor and then raying the results are better.

Dr. Russell H. Boggs (Pittsburg) was of the same opinion. He cited a case in which the tumor had been removed twice surgically without success. Excision followed by raying produced a cure, and there has not been a recurrence in six months.

Dr. E. G. Williams (Richmond) thought it better to excise first and ray afterward. In two cases, however, it was necessary to cause a most decided dermatitis before the tumors disappeared.

Dr. G. P. Girdwood (Montreal) treated two cases of extensive keloid with the ray alone. They both recovered and, so far, there has not been any recurrence.

## EDITORIAL

### THE BRITISH ELECTRO-THERAPEUTIC SOCIETY

The fourth annual meeting of this body was held in London on January 26, and the following officers elected for the current year: President, Mr. J. Hall-Edwards; Treasurer, Dr. Donald Baynes; Honorary Secretaries, Dr. E. R. Morton, and Dr. W. Kenneth Wills.

### THE GERMAN ROENTGEN SOCIETY

We are requested to announce that the second congress of this body will take place in connection with the Surgical Congress, April 8 and 9, 1906, at Berlin. The programme promises to be very interesting but cannot, of course, as yet be definitely recorded. Those desiring to present communications are requested to correspond with Prof. Dr. Eberlein, Luisenstrasse 56, Berlin N.W. 6, Germany, or Dr. Max Immelmann, Lutzowstrasse 72, Berlin W. 35, Germany.

### CURRENT PHYSIOLOGICAL THERAPY

*The Journal of Advanced Therapeutics, New York, N. Y., February, 1906.*

1. Practical Uses of the Sinusoidal Current. *Fred. Harris Morse.* — 2. Manual Therapy, an Invaluable Aid to the Electro-Therapeutist, A Plea for Its General Adoption. *John T. Rankin.* — 3. Sciatica. *Francis B. Bishop.* — 4. Synchronous Multiple-Pitch Variation Induction Currents. *Morris W. Brinkmann.*

1. See *The Archives* for December, 1905, page 342.

2. See *The Archives* for January, 1906, page 63.

3. See *The Archives* for January, 1906, page 52.

4. See *The Archives* for January, 1906, page 57.

*Archives of the Roentgen Ray, London, England, February, 1906.*

1. On the Use of the Diaphragm Compressor. *C. Thurstan Holland.* — 2. A Case of Gall-Stones with Radiograph. *C. Thurstan Holland.* — 3. A Roentgen-ray Tube-stand; A New Roentgen-ray Table. *Walter M. Brinner.* — 4. A Report of the General Utility of High-frequency Currents (*Continued*). *H. E. Gamlen.* — 5. On Osseous Formations in Muscles Due to Injury (*Traumatic Myositis Ossificans*) (*Continued*). *Robert Jones and David Morgan.*

1. Holland has been using a diaphragm compressor for two years, and considers it an essential, since by its use he is certain of getting a good

plate, and it has enabled him to obtain plates of the more difficult regions, such as the hip and shoulder, which are rich in detail and much more valuable diagnostically than plates made without the use of this device.

In the diagnosis of calculus either biliary or renal, the compression device is of value since it cuts down the respiratory movements, rendering the kidney immovable, and also cuts off the secondary rays.

His device consists of a simple metal tube fixed on the end of an arm which is attached to the tube-stand, and the top of the tube is covered by a metal shield twelve inches square, fitted with different sized metal diaphragms. The lower half of the compression tube is movable and can be removed and replaced by different shapes and calibres.

His compression tubes for kidney cases are curved so that one side can be pressed deep into the abdomen while the other edge rests on the lower ribs. The apparatus is simple, light, easily adjusted, cheap, and can be made by any good metal worker. He has used it in over five hundred cases, among these twenty-nine kidney cases, in five of which stone was demonstrated, one weighing less than two grains. Many of these cases were sent in for confirmation of a negative clinical diagnosis which explains the small percentage of positive results.

2. With the diaphragm described above, Holland succeeded in locating two gall-stones which were found on operation at the opening of the cystic duct into the gall-bladder. The stones were largely composed of bile pigment and cholesterin with some calcium. The roentgenograph was taken with a twelve-inch coil, a

mercury breaker, taking a current of twenty-four volts and ten amperes, a Cox regulating tube, and an exposure of two minutes. The stones were three-fourths of an inch long, were lying end for end in such a manner as to superimpose their shadows on the plate, and it was because of this position that it was possible to show them, since the stones singly cast but little shadow. The presence of the lime salt, the use of the compression-diaphragm, and the superimposition of the stones, rendered it possible to obtain a successful plate in this case.

3. Brickner's tube-stand is made of maple with a base heavy enough to prevent overturning, and with the upright graduated in inches. This is hollow and within it slides a heavy lead weight. A cord from the weight passes over a pulley at the top and is secured to the travelling arm which it accurately counterbalances, making adjustments easy. The travelling block on the upright moves on wooden rollers and is provided with a rubber friction wheel for making fine adjustments, and with clamps for securing it when the desired position is obtained. The horizontal arm is also graduated and moves backward and forward in the block by means of a similar device. Openings in the block permit exact reading of both scales. The tube is easily adjusted in any position from the floor up to six feet in height, and the entire apparatus being of wood does not short-circuit the wires.

The table is built of a framework of oak, is twenty-five inches wide and stands thirty-two inches high. The top of the table consists of a fixed portion forty-two inches long and a portion adjustable for height thirty inches long. The top is made of slabs of fiber which

are transparent to the ray, yet very strong. The surface is laid off in inch squares, and under the fixed portion of the table top slides a wooden shelf, laid off in corresponding lines. The shelf is perforated at each intersection of these lines for the insertion of buttons to hold the plate in position. When the shelf is returned to place, the position of the plate is directly under the corresponding cross lines on the table top, and in direct contact with the under surface of the fiber. By this device a plate can be placed in an exact position under the patient without disturbing him, and as many succeeding plates as desired can be placed in the same position. This is of considerable advantage in stereoscopic roentgenography. The hinged portion of the table contains a similar shelf.

The table is mounted on ball-bearing castors and is easily shifted, but contains at one end a device operated by a lever which lifts the end castors from the floor, thus fixing the position of the table. Attached to the side of the table and movable along it, is a modified tube stand described above, which slides easily back and forth from end to end of the table, and is instantly arrested and held firmly at any desired point.

4. Gamlen has seen high-frequency currents fail to benefit a case of paralysis caused by lead poisoning, another due to injury of the musculo-spiral nerve, two cases of ocular paralysis, three of infantile paralysis, one of anterior poliomyelitis, one case of spasmodic torticollis, two cases of facial paralysis, and one case of paralysis agitans, but an experience with thirty cases of hysteria, neurasthenia, etc., has convinced him that most affections of the nervous system, particularly those of a func-

tional nature, are surprisingly influenced by this modality. A case of hysteria received benefit, but it was mostly due to suggestion; few cases fail to improve if they have been promised improvement and have been impressed with the wonderful display from the apparatus.

One patient with cardiac palpitation, who had been refused life insurance, and complained of exaggerated symptoms of flatulence, debility, etc., was given twenty-four applications with complete success, the pulse rate falling from one hundred forty to normal. A case of aphonia of several months' duration, was given fifty treatments, after which she was able to speak in a monotonous whisper, thereupon local applications from the resonator were made to the throat by means of a vacuum tube electrode, and a smart reaction was caused. Then two applications to the inside of the larynx, with the suggestion that a complete recovery would follow, resulted in a permanent cure.

In rodent ulcer and cancer high frequency has been unsatisfactory, and better results are obtained by roentgenization. Experimental work has been carried on in diabetes, with a decided improvement in the quantity of sugar.

In cases of haemorrhoids with excessive irritation and pruritis, applications of five to ten minutes duration, twice a week, by means of a glass vacuum electrode introduced into the anus, are followed by some improvement. In external piles, the radical operation is the only thing worth considering. A case of chronic gleet was cured by a few treatments, a bougie being introduced and connected with the terminal on the top of the resonator; sixteen such treatments of five minutes' duration were necessary. A case of

gonorrhœa in a female was also cured by fourteen applications through a glass electrode. A patient suffering from indigestion, abdominal distention, and constipation, after the failure of medical measures alone, was put on daily doses of cascara sagrada and high frequency sittings, with a local application to the abdomen through a brush electrode from the resonator. In one month the condition had improved but the constipation was still distressing; upon the addition of massage to the abdomen from a mechanical vibrator, this symptom disappeared and the patient is now able to do without medicine.

*Journal de Physiotherapie, Paris,  
France, January 15, 1906.*

**1. A Case of Progressive Muscular Atrophy Treated by Electricity and Cured. Drs. Diamantberger and Albert-Weil. — 2. Thermotherapy, Especially in Dermatology. Dr. Leon Dekeyser.**

1. The case reported is particularly interesting because the disease is deemed incurable by all authors. A boy, aged seven, in whom the clinical diagnosis was made by several of the most competent authorities and confirmed by electro-diagnosis, was treated by triple-phased current hydro-electric baths associated with long, intermittent faradization.

The child was immersed up to the neck in water contained in a carefully insulated tube with non-conducting walls, and seated between two electrodes, the third one being placed before the knees. The first treatments did not give any improvement. They caused considerable itching and some vaso-dilatation phenomena mainly localized

on the trunk; after the twelfth treatment, some movements began to improve. The treatments (lasting twenty minutes) were continued daily for a month. At that time considerable improvement had taken place. The baths were then interrupted so as not to lose their effect through the establishment of tolerance. They were resumed a month later, and in a month the patient took nineteen. At that time, he was perfectly cured and has been in perfect condition ever since. An error in the diagnosis is not likely in this case, so that due credit must be given to the electrical treatment. Electricity is rejected as inefficient in many cases probably only because the proper modality is not resorted to.

2. The writer first recalls the classical experiments of Berger and Blagden demonstrating the difference of action of dry and moist heat and the attempts of Roth and Frey to give a mathematical value to that difference.

Heat is an excitant of the muscular system, up to a certain degree above which muscular reactions decrease and finally stop. The action on the heart is similar to that on the voluntary muscle with the difference that the reaction of the muscular fiber of the heart is spontaneous. Internal organs rich in unstriped muscular fibers react in the same way as the heart.

The excitability of nerves persists at a temperature where muscles are already paralyzed. Sensitive fibers are paralyzed quicker than the motor. Hence the induction of anesthesia by heat. Respiration becomes at first accelerated under the influence of heat, but if the temperature is raised beyond a certain point, slows down and finally stops. Respiratory exchanges and arterial pressure increase.

When heat is applied to the skin, there is a temporary contraction of the blood vessels. This is quickly followed by vaso-dilatation, the skin becomes pink, then red and if the application is prolonged may become oedematous. Naturally an active hyperemia is thus produced and nutritive modifications are increased. Thus the destruction of bacteria is favored, and so is the resorption of exudates and organic waste products. Higher temperatures produce a burn. Prolonged applications of dry superheated air may result in the appearance of a permanent oedema.

Moist heat has a somewhat different action. The latter is deeper, the penetration is slower and more progressive, the perspiration is less abundant than in the case of dry heat. The limits of bearable heat are considerably lower with moist heat. As soon as forty-two degrees C. (one hundred seven and five-tenths F.) is attained superficial blistering occurs in parts where the skin is thin and unprotected by hair. On hair-covered parts, three or four more degrees (F) are necessary to produce the same effect. In the very fat or those affected with different diatheses, pemphigoid blisters appear much more quickly. At forty-six degrees to forty-eight degrees C. (one hundred fifteen degrees to one hundred seventy-nine degrees F.) large and almost painless blisters are produced. At one hundred twenty two degrees F. small limited hemorrhages are formed in the deep layers of the skin. A higher temperature destroys leucocytes. Moist heat has also a mechanical cleansing action on the skin.

On mucous membranes, the application of heat produces first, desiccation of their surfaces. If the application be prolonged, a serous exudate oozes out. Every thermotherapeutist since Quincke

has devised a special apparatus. Linde-mann's apparatus for dry air is one of the best. Most of the appliances for moist heat are modified atomizers.

Superheated air is very valuable in the treatment of chronic rheumatism. Gonorrhreal arthritis and gout are also improved. The relief is remarkable. But the treatment is not to be advised during the acute period of rheumatism. Great care must be exercised in patients afflicted with arteriosclerosis or valvular lesions.

Most neuralgias, and particularly sciatica, improve under the same treatment. So do intercostal neuralgias, hysterical myalgias, hepatic and nephritic colics. Pleural and abdominal effusions disappear quickly under the influence of hot air baths. The same treatment applied to cases of nephritis requires a most strict supervision but might prove efficient in cases of impending uremia when the kidneys have failed to expel toxins which must be eliminated rapidly. In obesity, superheated air baths are very useful but the heart must be closely watched.

In surgery, hot air or scalding steam may stop hemorrhages; hot air is better than steam and has been used successfully many times to stop hemorrhages from parenchymatous organs. Steam douches hasten the cicatrization of wounds.

In gynecology, the applications of heat have been numerous and effective. Superheated steam has been used especially to control uterine hemorrhage. Sneguireff, Pinkus and Duhrsen have been the promoters of the method. The instrumentation consists essentially in a boiler connected with a flexible tube and a closed or open catheter. A special device protects the cervix uteri. The temperature may be raised

to one hundred fifteen degrees C. The closed catheter has very few indications. The rule must be: highest possible temperature, shortest possible application. Steaming reaches one-half millimeter deep in the uterine mucosa after thirty seconds and one millimeter after a minute. Three aims may be realized: *a*, cauterization, *b*, destruction of the mucosa, *c*, obliteration of the uterus. For the first two objects use a temperature of from one hundred five degrees to one hundred fifteen degrees C. during five to fifteen seconds. For the obliteration of the uterus one hundred ten to one hundred fifteen C. must be maintained for two or three minutes. This method must never be used if the appendages are not absolutely healthy and obliteration of the uterus should be used only in the cases where total extirpation would be indicated and when there is no cancer. The anesthetic and resolvent properties of thermotherapy are manifested in the treatment of acute and especially subacute diseases of the adnexa. Pain is the first modified element.

In oto-rhinology, high temperature vaporizations have given many successes to Berthold in the treatment of epistaxis; oedema of the glottis is happily influenced by moist heat. As a rule chronic affections of the nose seem to be benefited by vaporization while acute and subacute rhinitis and hay fever are amenable to superheated air. Corresponding results are obtained in similar ear affections.

Pannus scrofulosus and corneal ulcers and perhaps iritis may find some relief in thermotherapy.

In dermatology, the applications of the method are manifold and remarkable.

Chancroid is best treated by con-

tinuous irrigation. A pitcher containing several quarts of water is hung above the bed. A tube brings the water above the chancroid and lets it flow on it. Irrigations are given several hours a day, during the whole day even if necessary. A weak solution of permanganate of potash may be used but the good effects are derived from the heat, not from the antiseptic action of the solution. The same method may be applied to the treatment of buboes. Also to chronic atonic ulcers of the leg after curetting, to favus, achorion Celsi infection and parasitic syphilis. But acne is of all dermatoses the one most benefited by thermotherapy. Daily applications of water as hot as the skin will stand it, are always to be prescribed. Some appliances have been devised for the purpose. Heat has been employed also to provoke in other parts of the body a sufficient congestion to make the usual congestion of the face and the nose in acne rosacea disappear.

Very hot baths favor the absorption of mercury and hot air or vapor baths add to the elimination of toxic products and prevent mercurial poisoning. The efficiency of heat in psoriasis, prurigo, lichen, is very difficult to appreciate because topical applications are generally used at the same time. Most remarkable results are obtained in the treatment of seborrheic eczema of the face by steam vaporizations. Same with carbuncles of the neck. The method does not have any marked superiority in the treatment of generalized pruritus, pruritus vulvæ, or chronic urticaria.

Special reference is made to Hollander's method, that is the use of superheated air at three hundred degrees to eight hundred degrees. C. Hollander's apparatus is a thermocautery with an air bulb. The latter bears two rubber

tubes. One of these is connected with a bottle containing benzine and thence goes to the cautery, just as in Paquelin's instruments. The other one goes directly to the cautery where it sends a very strong current of air. The extremity of the cautery is perforated and perforated tips of different forms may be adapted to it. The cautery is heated with an alcohol lamp just like the Paquelin. A modification of this apparatus may be used with electricity. The air blown through the cautery becomes hot from contact with the red hot metal, and is projected on the skin from a more or less considerable distance. Narcosis should be used, because the pain during the treatment is intense. Post operative pain is generally very slight. This apparatus does not act as a simple cautery : the air has a selective action on diseased tissues, particularly on tuberculous tissues. After the use of hot air a dry dressing or some inert powder or vaseline may be applied. Hollander's method does not insure against recurrences, but the latter are less common and less rapid than after other methods. The process is very simple and is the method of election for the general practitioner especially in cases of large areas of lupus. It is not applicable to lupus erythematosus. The author has obtained very satisfactory results in fourteen cases of lupus, six of them of more than ten years' standing. The scar seems to be somewhat exuberant. Only one recurrence has been noted.

Hollander has employed his method for the treatment of cavernous angiomas, flexiform angiomas and congenital telangiectasis.

Strebel last year devised an apparatus using calorific rays concentrated on the skin through a system of lenses. The

source of heat is a three-ampere voltaic arc enclosed in a pear-shaped metallic box the smaller extremity of which is perforated with a circular hole.

A few lines are devoted to the physiological action of cold on the skin and to the treatment of *ulcus rodens* by spraying with ethyl and methyl chlorides. Ordinary forms of lupus are not benefited by congelation. Aming praises the latter method in lupus erythematosus. Dreune uses ethyl chloride and hydrochloric acid in cases of cutaneous tuberculosis and lupus, and apparently with good results.

*Bulletin Officiel de la Societe Francaise d'Electrotherapie et de Radiologie,  
Paris, France, December, 1905.*

1. High Frequency Currents in the Treatment of Sciatic Neuritis. Dr. Fauchon-Villeplee. — 2. Simple Apparatus for the Adaptation of the two hundred twenty Volt Direct Current for Electrotherapy. Dr. Fauchon-Villeplee.— 3. Goitre and Uterine Fibromyoma Treated by the Roentgen Ray. Dr. Kocher. — 4. Possible Influence of the X-Ray and High Frequency Currents upon a Syphilitic Gumma. Dr. Laquerriere.

1. The writer has used high frequency currents obtained from small solenoids, and the high frequency and high tension effluvia. The latter give the best results in recent cases, the former in cases of long standing. High frequency effluvia cure ulcers due to the dilatation of veins in about one-third of all cases. Circular-shaped ulcers heal less readily than irregular ones. In some cases, mixed treatment has helped cicatrization, even when there was not the slightest reason for suspecting syphilis.

In order to obtain results in cases of

sciatica, it is necessary to use as high as four hundred ma. for ten minutes. Six cases are reported that were cured after six, ten, four, three, three, and three treatments respectively. One other case improved but did not come back.

2. The current passes first through a switch and then through a thirty-two-candle power incandescent lamp which limits the quantity of electricity to five hundred ma. Then it follows two lines: first, the utilization line passes through a Guilloz rheostat, a milliamperemeter, the positive pole, the body of the patient, the negative pole, and finally joins the return line; second, the accessory line begins after the incandescent lamp, goes through a lamp of the same power and joins the utilization line at a certain point beyond the patient whence it goes to the return line.

This shunt arrangement works excellently. Without it the current is not equal and it is very disagreeable for the patient. The resistance must be carefully selected and when an incandescent lamp is used its power must be at least the same as that of the first lamp, or else the current is not uniform. We may use a liquid resistance but the inconveniences are the same as with a liquid reducer of potential.

3. In a woman forty-five years old who had a large goitre developed in the left lobe of the thyroid gland and who began to have slight suffocating paroxysms, Kocher gave thirty treatments of four H. each; the irradiation being given at different times on the middle or on the right or left lateral regions of the neck, the unexposed parts being protected with sheet lead. Considerable improvement followed and the dyspnœa disappeared. The apparatus

consisted of a Radiguet coil, of thirty-five centimetre spark, working with a Wehnelt interrupter on a one hundred ten volt alternating current. In the circuit was a Chabaud ventril tube with osmoregulator and a self-regulating tube of medium hardness. The distance between the tube and the skin was fifteen centimetres and the intensity of the primary current varied from six to seven amperes.

The same application with a rather hard tube (No. 8 Benoist) placed at twenty centimetres from the skin was used in a case of hydrorrhæic fibroid. The treatments lasted about a quarter of an hour; each was given over the different parts of the tumor successively. The ovarian regions were specially irradiated (the patient having been informed of the possibility of sterility and having given her consent).

The tumor had noticeably diminished after twenty treatments. As an operation was contraindicated on account of the cardiac condition of the patient, twenty-five other treatments were given without much result. The tumor is smaller, the general health is much better, but the hydrorrhœa persists.

4. A patient, twenty-eight years old, presented an ulcerated cervical adenitis which was diagnosed as tuberculous. High frequency and X-ray applications cured him for a short time but the ulcer opened again; the patient went then to the St. Louis Hospital where he was given the mixed treatment which effected a permanent cure. Does the high frequency current and roentgenization cure syphilitic lesions? It seems that an improvement has been sometimes noted in those conditions after the use of electricity.

*Bulletin Officiel de la Societe Francaise d'Electrotherapie et de Radiologie, Paris, France, January, 1906.*

1. Sinusoidal Voltaism and Maladies of Nutrition. (*Continued*), Dr. H. Thielle. — 2. Some Thoughts on Electrical Treatment. Dr. Paul C. Petit. — 3. The Effect of High Frequency Currents. Dr. Bonnefoy. 4. A Compression Cylinder and Diaphragm for Radiotherapy and Radiography. Dr. Chabry. — 5. Syphilitic Gumma of the Mustache Simulating Sycosis, Rebellious to Mercurial Treatment, Cured by Six Applications of the X-Ray. Dr. Rene Desplats. — 6. Under Certain Circumstances Grave Radiodermatitis may be Observed after the Administration of only 5 Holtzknecht Units. Dr. Lacaille. — 7. Electrical Treatment of Pain in the Lumbo-Sacral Region. Dr. Bordet.

1. This is a continuation of Thielle's article and describes individual cases of arthritis and rheumatism which have been cured by the sinusoidal voltaic current. Analyses of urine show that the effect was to increase metabolism.

2. In a severe case of neurasthenia, all treatments having failed, Dr. Petit gave, every other week, daily injections of five centigrammes of sodium cacodylate, and at the same time a static bath of fifteen minutes' duration followed by a five-minute static douche and an application of high frequency currents lasting from one to two minutes. The latter was given with the glass electrode used for anal fissure applied directly to the skin and moved from place to place. And last, eight treatments of general massage were administered from time to time.

The action of the high frequency

current was very evident. The patient felt very comfortable after each application, but the latter had to be short, or else it would cause fatigue. The treatment was continued during five weeks. At that time the improvement was very marked. The analysis of different specimens of urine shows that the treatment did not act simply by suggestion, but that a sluggish nutrition was powerfully stimulated. High frequency seems to be better than static electricity in the treatment of neurasthenia, and gives good results in auricular vertigo, so often a prominent symptom of the disease.

3. This is an open letter to the British Electrotherapeutic Society and an answer to a communication of Dr. Maclure. The latter seems to have taken arterial tension and temperature as superposable terms. Now the temperature of the body is not directly proportional to the blood pressure. Indeed in some cases, the reverse is true and the temperature increases as the hypertension falls. But this action is seen only after a certain number of treatments, eight or ten at least, and the increase of the temperature does not appear at once in all parts of the body.

High frequency currents have but an indirect action on the heart and the central circulation, while they directly influence the peripheral circulation through vaso-motor nerves. And the writer has always noted, in cases of sluggish nutrition, that, after a few treatments, the patient felt his body and even his extremities warming up, and at the same time the arterial tension was decreasing. Therefore, as there is no direct action on the heart, why should we object to high frequency in cases of cardiac insufficiency? Dr. Bonnefoy and others have had

brilliant successes with heart disturbances. Consequently Maclure's fears about the use of high frequency in patients having a depressed arterial tension are not justified. His statement that static electricity is better for those patients is only partly true. All depends on the cause of the lowering of the blood pressure; if the latter is caused by a sluggish nutrition or by an auto-intoxication, high frequency may be resorted to without the slightest hesitancy. On the contrary anaemic convalescents, or neurasthenics, or patients whose brains have been overtaxed are amenable to franklinization.

The dangers of high frequency are purely imaginary; the inconveniences of too frequent treatments have been also much exaggerated. The writer received himself one hundred fifty treatments in 1902, one hundred thirty in 1903, and eighty in 1904. The only effect was a considerable improvement in his gouty temperament. One of his friends, a doctor, has had a similar experience with equally good results.

4. This appliance consists of three brass tubes adjusted like those of a telescope. Each one is five cm. high and fifteen cm. wide. A screw maintains them in place. By changing the relative positions of the tubes, we may obtain all lengths from five to fifteen cm. On the side which faces the Roentgen ray tube, there is a diaphragm. On the other end of the appliance may be adjusted a circular ring enclosing a sheet of lead. In the latter, we may cut out an opening corresponding to the surface under treatment. Two holes allow a Holzknecht or a Sabouraud-Noire tablet to be placed, the first close to the treated part, the latter midway between the tube and the part. This appliance may be fastened on Drault's support, or on

any other kind; it suppresses all divergent rays and may be used as a compressor for radiography.

5. A man, forty-four years old, had had, previously, several manifestations of syphilis which healed under the influence of specific treatment. In September, 1904, under the left nostril, there appeared a red pimple. Mercurial treatment was of no avail. The sore extended every day, there was an abundant suppuration. A purely external course of treatment failed also. Finally malignancy was suspected but histological examination of an excised fragment showed only inflammatory lesions, similar to those of a syphiloma.

Desplats tried roentgenization simply because the latter gives good results in all kinds of skin diseases and because he thought the hair acted as an irritant and it would be good to have it fall out. On August 7, 8, 9, 1905, he gave three treatments of ten minutes each, the part being fifteen centimetres distant from the anticathode, and the rays corresponding to four or five Benoist ( $7\frac{1}{2}$  H.). On August 21, the suppuration had stopped, and the improvement was marked. August 21, 22, 23, three more treatments (eight H.). On August 31 the patient was absolutely cured. He has been receiving mercurial injections since and has not had any other trouble.

6. A patient who had been treated unsuccessfully for lupus by Finsen's method, received two Roentgen treatments over two distant points. The anode was fifteen centimetres from the lesion, and the ray quality four or five Benoist. The quantity absorbed by the skin, as indicated by a Sabouraud tablet, was five H. A severe radio-dermatitis followed: there was an ulceration about the size of the hand, red and

yellow, suppurating, extremely painful. Perhaps the susceptibility of the patient had been exalted by the previous Finsen treatment. Or was it due to the lupus? Or has there been superposition in the action of the two treatments?

The opinion of most members of the Society is that the test tablets for Roentgen dosage are often unreliable. And it is necessary to regulate the apparatus frequently, because there are considerable variations from one day to another, or even from one hour to another so that if an apparatus has given five H. sometime before in so many minutes, it does not follow that it will later give five H. in the same number of minutes at some other time. If the tube is not often tested, we may have serious accidents even when we think we remain within absolutely safe limits.

7. The causes of pain in the lumbo-sacral region may be classified as follows:

- a. Muscular ruptures.
- b. Lumbago.
- c. Muscular rheumatism.
- d. Sacro-vertebral and coccygeal arthritis.
- e. Sacral and lumbar neuralgia.
- f. Lumbalgia related to kidney stones.
- g. Myelitis and surgical affections.

In muscular ruptures the best treatment is De Watteville's current, produced with a coil of fine wire. The negative pole of De Watteville's combiner is connected with an electrode with a surface of one hundred square centimetres and the other with a similar electrode. Both are placed on the injured muscle. Current used from ten to fifteen ma. A few treatments are enough.

In lumbago, fine wire faradization yields the best results. Two large electrodes, five centimetres in diameter,

are placed on the muscular masses and the negative pole is moved slowly over the painful points. The current must be as strong as possible. Very rapid interruptions. Treatment lasts for ten minutes. The sedative effect is instantaneous. Recovery is obtained after four or eight treatments.

Muscular rheumatism is best treated by the continuous current or by galvanization with sodium salicylate. The latter method introduces salicylicions in the tissues and gives very rapid results. Two electrodes of two hundred square centimetres are covered with about a hundred sheets of absorbent gauze. The negative electrode is then thoroughly soaked with a four per cent solution of sodium salicylate and is placed over the most painful point. The other electrode soaked in luke-warm water is placed on the lumbar region at a few centimetres distance from the first. Current is increased progressively to fifty, sixty and eighty ma. Treatments last from fifteen minutes to one hour, and are given daily. Sacro-vertebral and sacro-coccygeal arthritis requires the same treatment as rheumatism. The treatments must be long and be given daily. When the pain has subsided, it is good to give after galvanization a short fine-wire faradization over the lumbo-iliac and vertebral muscles.

Neuralgia of the lumbar plexus is very markedly relieved by electrical treatment, either continuous galvanization with a strong current or high frequency. The treatment lasts for fifteen minutes. Sedation appears two or three hours after treatment, which must be given at first daily and later every other day.

In neuralgia of the sacral plexus, direct applications of high frequency or

effluation are very efficient. Galvanization of the sciatic nerve may be used also.

Lumbalgia of renal lithiasis is happily influenced by high frequency effluation or sinusoidal currents given when the patient is in a bath.

In various other affections the electrical treatment may be applied as a

diagnostic test. First if fine-wire faradization exaggerates the pain we can eliminate lumbago and muscular ruptures. Then try continuous galvanization with or without sodium salicylate, and if relief is not obtained, try high frequency currents. If everything fails look out for an organic, perhaps surgical, affection.

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## ELECTROTHERAPY

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**Galvanic Treatment of Habitual (Chronic) Constipation.** (*Mark W. Peyser, Virginia Medical Semi-Monthly, February 9, 1906.*) Peyser believes we have an agent in the galvanic or direct current of electricity, without superior in chronic, idiopathic constipation.

Unstriated muscle tissue is not easily made to contract by the induced, interrupted current, especially if the excitability of the tissue be diminished. But the direct current is quite capable of producing intestinal peristalsis, even in cases of paresis, particularly if it be slowly interrupted; and this, by the way, is true in paralysis of striated muscle tissue where nerve innervation is lost and the tissue does not respond to the faradic current. We thus understand the value of this form of electricity in habitual constipation where there is diminished irritability of the nerve supply, and atony or degeneration of the muscular coats.

Before the advent of the electric injection, a metallic electrode was introduced into the rectum, but either because of the danger of electrolysis of the mucous coat of the intestine, producing scars, or inefficiency because of the small amperage that could be employed, the method fell into disuse. It was

revived, however, upon improvement of the technic which permits the use of a larger amount of current, and which is as follows: A short, soft, rubber, rectal tube in which is placed a metallic conductor, is passed into the rectum, coiling in the ampulla being prevented if possible. The metallic conductor is attached to the positive pole. The tube is connected with a tube of a fountain syringe which contains saline solution. A large pad electrode well moistened with saline solution or thoroughly soaped, is attached to the negative pole. While the solution is flowing or after the syringe is emptied, the current is turned on and gradually increased in strength till from fifteen ma. to twenty ma. are passing, or until the patient complains of burning at the negative pole. There should be no sensation from the current at the positive pole. The solution in the bowels acts as one of the terminals, thus spreading the current over a large extent of surface and permitting more current to be used. Similarly, the large pad permits increased amperage.

In a varying period of time desire for defecation comes on, sometimes immediately, sometimes not for several hours. Should it come immediately, the patient should be persuaded to endeavor to

continue the treatment for awhile longer. The succeeding evacuation may consist of the solution only, of the solution stained with coloring matter, or of feces, most frequently the last.

That it is the electricity and not the saline that is the exciting factor, is demonstrated in many instances by the fact that ordinary enemata have been absolutely without effect. There are apt to be stools succeeding the first application and usually, when the patient presents himself the next day for treatment, he will have had one that morning.

The number of treatments required varies from six to ten, rarely less than the former or more than the latter. The tolerance of the patient should be the standard as to the quantity of current, some taking twenty ma. even at the first treatment, others never being able to take more than twelve ma. at any time. The time of each treatment should be from fifteen to twenty minutes seldom more, repeated daily till positive effects are obtained, and then at lengthening intervals till success is assured or failure manifest.

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**Constipation.** (*W. J. Wilson, The Canada Lancet, February, 1906.*) After naming different causes of constipation the author states that the atonic form is the most common and that this may be induced by deficiency of fluid ingested, neglect of the call to stool, faulty diet, irregular meals, loss of sensitiveness of the rectum, debility, sedentary habits, abuse of purgatives, diseases of the stomach, brain, spine, etc.

After calling attention to the necessity of obeying the call to stool when it occurs and recommending regularity of living as regards the taking of meals, rest, and exercise, he says: "A conven-

ient time should be selected for going to stool. Immediately after breakfast answers well with most people. A full mixed diet should be taken, avoiding fads and including a sufficiency of vegetables, fruits and fats, and in fats we include butter, cream, gravies and fat meats. Olive oil is often beneficial, either on salads or in any other form.

"Liquids, and especially water, should be taken in sufficient quantities. A good glass of water at bedtime, and again first thing in the morning, is often beneficial. Cider, buttermilk, and koumiss are useful adjuncts.

"Olive oil enemata, after the patient retires for the night, are very useful. We begin with one to two ounces and gradually increase to four or five ounces, and then at the same rate reduce the amount used. If taken before the patient is in bed, it is more difficult to retain.

"We have found this treatment useful, both in the atonic and spastic forms of constipation.

"Massage in the atonic forms is very useful. Where this cannot be procured we may give directions for a limited kneading of the large intestine, following its course from right to left. A metal ball of three to five pounds weight and covered with some soft material may be used by the patient before arising every morning, passing it around the abdomen in the same line as recommended for the massage.

"Massage of the abdomen has, however, been found not well suited to the spastic cases, and, when indicated for the general condition of such patients, should be used on all parts except the abdomen.

"Mineral waters are often useful, but must be used with discretion. The atonic, dilated stomach will not stand

the weight of the large quantities of water often recommended and again the water must be carefully selected for the individual case, e.g., the acid waters would not be suited to the cases with hyperchlorhydria. A word more might be said about purgatives. They are much abused and as commonly used do much harm. In many cases, they are unavoidable, but should be carefully selected and used for a limited time only. Laxatives are frequently of use while we are toning up the system, and directing our patient to depend more on hygiene and diet.

"Electricity may in some cases be used to good advantage especially in conjunction with massage. It may be applied through a rectal electrode with a sponge on the abdomen, moved in the line of the large bowel. In some cases electrolysis may be used to advantage.

"We must, of course, in every case, bring the patient's general condition to the highest point possible by tonic and hygienic measures, and use our ingenuity in adapting the best measures to the individual case."

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The Treatment of Some Forms of Embryonic Growths by Electrolysis. (*Charles R. Dickson, Canadian Journal of Medicine and Surgery, February, 1906.*) After a short description of the different forms of nevus Dickson says that, apart from the cosmetic standpoint, these growths should not be neglected as they sometimes take on malignant or other degenerative tendencies. All newborn infants should be carefully examined within a few days of birth as nevi frequently escape detection during the early months of life, and should one appear it should be removed at once.

The majority of nevi are amenable to treatment by electricity and when

this agent is properly employed and cases well selected this remedial agent is preferable to any other; in no other operation, however, are experience and judgment more important. Better scars are secured than by any other method. Catarrhal conditions of mucous membranes, eruptions, or other irritable conditions of the skin are contra-indications as they tend to retard healing and provoke suppuration. Such conditions should be removed before the electrolysis is applied. Other things being equal, however, it is better to electrolyze nevi when the child is young and the tissues more easily susceptible of influence than later in life.

No hard and fast rules as to technique can be laid down but unless the patient is an adult general anesthesia is usually imperative for the purpose of eliminating movements. Parts should be perfectly quiescent until the operation is completed and the dressings in place. When the removal of redundant tissue is desired the positive pole should be active, both because of its directly destructive action and because it produces artificial thrombosis by coagulation. When it is desired to promote absorption or to block up capillaries by bubbles of hydrogen, to cause atrophy, or when a scar is particularly undesirable, the negative pole should be active. Dickson prefers platinum-iridium needles for positive puncture and gold needles for negative puncture, the indifferent electrode to consist of perforated brass plaque or brass wire gauze faced with piano-maker's felt and backed with rubber sheeting. The gold needles may be readily bent to any desired curve. Zinc needles amalgamated with mercury are sometimes also of service, especially in cavernous angiomas. Any of these needles can be insulated by

collodion on those portions which it is desired should not be active. The indifferent electrode should be about four and one-half by seven inches.

In nevus pigmentosus if hairs are present they should first be removed by electrolysis in the usual manner. The active electrode is then attached to the negative pole and just sufficient current used to blanch the part, after which the needle is withdrawn and reinserted in different portions until the whole nevus has been blanched. In some cases it is possible to attack the whole growth through one external opening if the needle be curved, and a smaller cicatrix will thereby result. Usually the current need not be shut off at each withdrawal of the needle as only from one to five ma. are ordinarily used but with larger nevi where greater current strength is necessary it is best to cut down the current when the needle is withdrawn and not turn it on again until the needle has been placed.

In nevus vasculosus simplex only a limited portion should be treated at a time and the growth should be attacked from the edges, a single fine needle connected with the negative pole being used and left in position only long enough, and only sufficient current used, to blanch the part. Punctures should

not be close enough together to coalesce. When the growth consists of small dilated vessels just below the surface it is often possible to transfix the vessel supplying it and block it with bubbles of hydrogen and so cut off the blood supply. "In angioma cavernosum either the monopolar method is employed with a platinum-iridium needle in the growth and attached to the positive pole, or an amalgamated zinc needle used in the same manner, or the bipolar method with both needles, positive and negative in the growth may be found preferable, especially where there is much hypertrophy. In the latter case the aim should be to insert the negative needle into or transfix the supply vessel while the positive is in the redundant tissue. Greater current strength will be necessary in the case of cavernous nevus, but rarely should our meter register up to fifty ma."

Hemorrhage is not usual after electrolysis but should it occur pressure will take care of it. A flexible collodion dressing is the most convenient. If a second operation is necessary it should not be performed until the original area treated has completely healed. In a general way it is "better to do too little and repeat than too much and repent."

### RADIODIAGNOSIS

**Roentgen-Ray Diagnosis of Chest Diseases.** (*J. E. Talley and W. S. Newcomer Jour. A. M. A.*, February 24, 1906.) The authors mention some of the advantages of the roentgenoscope over the roentgenograph in the diagnosis of chest diseases and describe a new form of screen which they have devised which acts as a recording apparatus and at the same time protects the operator from burns. As a supplementary method in

diagnosis, roentgenization appears to them to have a decided advantage over percussion, using, as it does, the higher development of the sense of sight as compared with that of touch. A pneumonia developing deep in the chest may be revealed by roentgenization before other signs and symptoms are conclusive. In children with their thin chests it is especially valuable, but the authors have used this method success-

fully and frequently in adults. In no class of cases has it been more useful than in making an early diagnosis of secondary involvement of the mediastinal glands after operation for cancer of the breast. In the study of the heart and great thoracic vessels it is most satisfactory, and here the roentgenoscope shows the living, moving organs, while the roentgenograph resembles more the blurred outlines of a composite picture. Illustrative cases showing the advantage of the roentgenoscope in this work are given. In conclusion, the authors state that, in their belief, this method, rarely inferior to other methods, usually at least equal to them and sometimes superior, is bound to have a wider recognition and use than at present.

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**On the Importance of Roentgen Rays for Dentistry, (A. Kunert, *Zeitschrift fur Elektrotherapie und Elektrodiagnostik*, January, 1906.)** In the first part of this paper the author gives a thorough report of what has been published in

that field and what dentistry has gained by the discovery of Roentgen. It is to be regretted that the American literature has been almost entirely neglected in that report. In looking over the publications hitherto made the author thinks, that while for diagnostic purposes Roentgen rays have been applied in the most manifold manner, their use for therapeutic purposes has been limited to a few investigators, as for example Guy, Price and Parkes. Only in pyorrhœa alveolaris have they tried these rays and with contradictory results. Guy and Price claim to have had good results, while Parkes only saw an effect after adding the high frequency current to the treatment.

Kunert believes that the different ætiological factors in pyorrhœa alveolaris may have been the cause of the different results in treatment. In conclusion Kunert cites some of his own cases in order to demonstrate the importance of roentgenographs for diagnostic purposes in dentistry.

## RADIOTHERAPY

**The Treatment of Mediastinal Carcinoma with the Roentgen Rays, (G. E. Pfahler, *American Medicine*, February 10, 1906).** The treatment of mediastinal carcinoma has always seemed a hopeless task, and must still be considered a very grave condition with little hope of cure.

This report is based upon the treatment of six cases. In all of the cases the disease followed carcinoma of the breast, and occurred after the removal of the breasts by operation. The cases were referred by the surgeons who had operated upon the patients. There seems to be no doubt as regards the diagnoses which were based upon the presence of a prominence or actual

tumor in the region of the mediastinum, an area of dullness, the presence of dyspnoea, cough, paralysis of the vocal cords, and the presence of a shadow in the region of the mediastinum shown by the radiograph. One case had a palsy of the left arm due to compression of the cervical plexus by the deep cervical glands. She recovered from this paralysis, as well as from the local recurrence in the mammary region, and the mediastinal involvement.

Three of the six cases were of the most extreme type, with much weakness, marked dyspnoea and cachexia. These improved slightly, then followed the usual course and died. The remaining three apparently recovered. The

saving of fifty per cent of cases that were absolutely hopeless under any other therapeusis should give much encouragement, and justifies persistent and routine treatment of even these advanced cases.

The treatment is a prolonged one. Most of the cases were treated daily for several months, then less frequently. The tube was placed at a distance of about fifteen inches, and the direction of the exposures varied. The tube vacuum was two and one-half inches and the exposures varied from ten to forty-five minutes.

**Enlarged Glands of the Neck Successfully Treated by the X-rays** (*Milward E. Dovaston, London Lancet, February 10, 1906.*) The patient was a girl eighteen years of age who sustained an attack of scarlet fever in May, 1900, which was followed in a few months by gradual enlargement of the right cervical glands. These resisted ordinary methods of treatment and were surgically removed in 1902. In 1903 the glands on the left side became enlarged and resisted treatment until she came under Dovaston's observation in September, 1904.

"She then had a conglomerate mass of enlarged glands, varying in size from that of a walnut to that of a hen's egg, extending from the angle of the jaw on both sides and meeting under the chin. They were hard, elastic and movable and diminished in size from above downwards. On the right side of the neck were two cicatrices, one eight inches long horizontally and another five inches long vertically, where removal had been attempted. There was no history of tuberculous disease obtainable. Treatment with the X-rays was begun on September 26, 1904, and continued until July, 1905. The exposures

were given for the first two months four times a week, afterwards three times, and the last five months twice a week. The improvement was at first evident in the disappearance of the tissues binding the glands together, after which the individual glands became more definite. The glands themselves then gradually lessened and eventually disappeared, leaving a perfectly formed neck on either side which has remained so up to February 1, 1906."

**Two Cases of Leukaemia Treated by the Roentgen Rays.** (*W. Ironside Bruce, London Lancet, January 27, 1906.*) Bruce makes a preliminary report upon two cases of leukaemia which he is treating by roentgenization.

*Case I.* Woman fifty years of age, who had previously suffered from malarial fever. When she came under his observation she was very weak and rapidly growing weaker, complained of great pain and tenderness over the splenic region, her temperature ranged from ninety-nine degrees F. in the morning to one hundred three F. at night, and she had occasional chills. Spleen was enlarged considerably, reaching beyond the middle line and its lower margin could not be felt. Blood count showed erythrocytes 3,047,520 and leucocytes 400,147, differential count not made. Roentgenization consisting of ten minutes exposure of the splenic area, five minutes exposure of the sternum, and ten minutes exposure of the knees to a hard tube taking about two and one-half ma. of current, tube being twelve to fifteen inches from the skin, was applied every day. For the first three months, intramuscular injections of arsenic in full doses were also used.

The pain began to grow less at once,

and the patient slept better. After two months treatment the general health had much improved, the temperature now very rarely being above one hundred F. even in the evening. After six months treatment the leucocytes dropped to 32,200, the erythrocytes increased to 4,550,000, the patient's weight increased, the size of the abdomen diminished, the spleen was much smaller and the general condition still improving. Daily treatment is still being continued.

*Case II.* A young woman twenty-three years of age. Spleen was considerably enlarged with an ill-defined outline, she was very anaemic and emaciated, abdomen greatly increased in size. There was also present aortic and mitral regurgitation. Blood examination showed erythrocytes 2,300,000, leucocytes 1,440,000, myelocytes 34.4 per cent, polymorphonuclears 52.5 per cent, eosinophiles 6 per cent, nucleated red corpuscles six per cent, poikilocytosis was fairly marked, haemoglobin thirty-four per cent. Temperature fluctuated between ninety-eight degrees F. and one hundred degrees F. Patient was unable to leave her bed.

Roentgenization was commenced, ten minutes' exposure to a hard tube over the splenic area every other day.

A week afterward she was able to get up and three weeks later was discharged from the hospital, her blood at this time containing 3,020,000 erythrocytes, 232,000 leucocytes, haemoglobin thirty-seven per cent. Poikilocytosis was much decreased and the spleen was smaller with a better-defined outline.

Since then the patient has walked to the hospital to have treatments applied over the spleen, sternum and knees each day on alternate weeks. Five months later erythrocytes were 4,750,000, leuco-

cytes 42,200, haemoglobin forty-six per cent. Spleen was much smaller, body weight increased, general condition good, and she was attending to her household duties. From this time on she did not attend for treatments regularly and although her general condition is fair and she is attending to her home duties, blood examinations show that the improvement reached at one time has not been quite maintained. The result in this case was particularly gratifying as the patient was very sick when the treatment was commenced, being bedridden, and has now been restored to a condition of usefulness and comfort.

The fact that most cases of dermatitis arising in Roentgen workers were confined to the hand and wrist led Bruce to believe that cloth exercises a protective influence over the parts covered by it and for this reason he treated *Case II* through one thickness of linen table-cloth which was interposed between the tube and the skin, and *Case I* through four folds of felt each one-eighth of an inch thick. The result in both cases was to eliminate any erythema although heavy doses of Roentgen radiance were used.

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Haematological and Chemical Observations in a Case of Spleno-Medullary Leukaemia under X-ray Treatment, with an Account of the Histology of the Haemopoietic Organs after Death. (*J. C. G. Ledingham, London Lancet, February 10, 1906.*) This is the completion of a report of a case upon which a preliminary report was made in the *London Lancet* for January 4, 1905, abstract of which will be found on page fifty-two of *The Archives* for February, 1905. This first series of roentgenizations resulted in great improvement of the patient's general condition and a drop

in the number of leucocytes from 200,000 to 20,000 in the course of six weeks and a very appreciable rise in the number of erythrocytes. Maximum of the erythrocytes' increase was not reached, however, until a week or more after this series of treatments had been suspended at which time the leucocytes had already begun to increase again. During the following three months the patient's general condition continued to be excellent and frequent blood examinations showed that the white cells were rising in number gradually and irregularly. At the end of this time they numbered 60,000. Ledingham considers it significant that during this three months suspension of roentgenization the leucocytes rose to only about one-third of what they were at the commencement of the treatment. This demonstrates that the procedure had exerted an inhibitory influence on the proliferative functions of the blood-forming organs.

Roentgenization was resumed four months after cessation of the first course and again produced a remarkable response. The leucocytes fell progressively during six weeks to 7,000. At this time the patient was attacked by influenza which resulted fatally about six weeks later, a count being made shortly before death which showed that the leucocytes had risen to 43,000. This observation is significant inasmuch as that it is a well-known fact that intercurrent affections in leukæmia usually produce a great diminution of leucocytes, but in the leucopenic stage in this case the reaction was in the opposite direction.

An autopsy was obtained at which the following conditions were found to be present.

"Both the lungs were much congested

and in the right lung were several patches of catarrhal pneumonia. Both liver and spleen were enormously enlarged, the latter organ weighing seven and one-half pounds. The lymphatic glands on each side of the spine, both in the abdomen and thorax, were also enlarged and varied in size from that of a pea to that of a large bean. The bone marrow, as seen in the sternum, vertebræ, and ribs, had a pale pink colour. Without entering into details it will be sufficient here to note the more important changes in the blood-forming organs.

"*Spleen.*—Malpighian follicles were practically absent. There was a marked development of coarse connective tissue pervading the spleen pulp but this fibrotic process had not advanced to the degree which one generally finds in chronic cases of spleno-medullary leukæmia. The predominant cellular constituents of the pulp were large, mononuclear cells with intensely basophile protoplasm. Their nuclei were round or oval and slightly vesicular. In their morphology they resembled the basophile myelocytes of Dominici. Numerous mitotic figures in all stages were seen in these cells. Fully developed cells of the neutrophile series were very scarce.

"*Lymph glands.*—No nodes were visible. Large basophile cells were here also predominant but there were also enormous numbers of giant cells mostly of the megakaryocyte type. Here and there were noted small groups of cells with ill-defined contours containing in their interior two or three densely stained half-moon-shaped bodies. It is probable that these cells represent degenerated megakaryocytes but it is difficult to explain how the broken-down

nuclei should assume such regular semi-circular forms.

*"Marrow from the sternum and ribs."* — So far as its cellular constituents were concerned the marrow might be said to be in a markedly hypoplastic condition. Bony lamellæ and strands of connective tissue traverse the section, leaving small isolated cellular areas. Small or large lymphocytes were most numerous. Large basophile cells were scarce and giant cells were not nearly so numerous as in the lymph glands. Nucleated red cells were also very scarce.

*"Liver."* — The interacinar capillaries were quite choked with leucocytes, the great majority of which consisted of the large basophile cells met with in the spleen and glands."

In order that the changes observed in this case may be compared with those observed by other men as the result of roentgenization he describes the findings of these other observers as follows : " Heineke found that the exposure of small animals such as mice to the X-rays produced a destruction of the lymphoid follicles in the spleen and lymph glands. The nuclear detritus was taken up by phagocytes and the node was replaced by connective tissue and epithelioid cells. Prolonged exposure was followed by partial destruction of the granular cells of the marrow. Mosse and Milchner showed that in animals exposed to the X-rays the bone marrow is profoundly influenced. The changes affect principally the cells of the neutrophile series which are greatly diminished in numbers, the surviving cells exhibiting great deficiency of granules. The experiments of Halber and Linser are even more remarkable. By prolonged exposure of small animals to the X-rays they were able to deplete the circulating blood entirely of leucocytes (as measured

by ordinary counting methods). The larger the animal the more difficult it was to free the blood of leucocytes and frequently in rabbits and dogs it was impossible to get lower counts than fifteen hundred or two thousand by continued exposure. They maintained from examination of films that the destruction of leucocytes took place in the general circulation and not in the blood-forming organs. Further, fatal results sometimes ensued which they attributed to the evil effects of leucotoxins set free from the broken-down leucocytes. The serum of X-rayed animals had also the power of causing the destruction of leucocytes when injected into fresh animals. The question as to whether a destruction of leucocytes takes place in the general circulation is an important one. Most observers, with the exception of Gravitz, Aubertin and Beaujard, Weil and Aubertin, are inclined to doubt that intravascular leucolysis takes place to any great extent in leukæmia. At least, cytolytic changes in dried films have not been specially noted in the recorded cases but it is quite conceivable that in the lymphatic form of leukæmia more particularly large numbers of lymphoid cells are destroyed in the circulating blood. From Halber and Linser's experiments these latter cells appear to be the most susceptible to X-ray influence. Is the diminution of the leucocytes in the circulating blood to be attributed to increased destruction of cells in the hæmopoietic organs or to inhibited production? If increased destruction is the cause one might expect to find evidence of this in the uric acid output. During the five months preceding the adoption of X-ray treatment in our case frequent analyses of the uric acid output were made with a view to deter-

mine whether according to Horbaczewski's theory any relationship could be found between the purin output and the leucocyte count. At the same time estimations were made of the total nitrogen and total phosphoric acid. Before commencing these investigations it was anticipated that a stage in the progress of the disease might supervene in which the leucocytes might show a progressive tendency to diminish, so that one might definitely demonstrate whether a simultaneous rise in the uric acid took place as the result of leucocyte destruction.

"As already noted, however, no progressive diminution took place in the leucocyte count during these five months although marked oscillations were frequent. As has been so frequently noted in leukæmia, the absolute amount of uric acid excreted was found to be much in excess of the normal but it was impossible to demonstrate constantly any rise in the uric acid as the immediate result of a temporary fall of the leucocytes, lasting perhaps one or two days. Nor could any clue as to the occurrence of leucocyte destruction be obtained from the amount of phosphoric acid excreted. This was slightly higher than normal but it bore the usual proportion to the total nitrogen excreted.

"When the leucocytes were progressively falling under X-ray influence a further short series of urinary analyses was made. It was found that the total amount of urine passed per day had slightly increased. The total nitrogen and total uric acid were both relatively high but the percentage of uric acid nitrogen in the total nitrogen remained only slightly affected. The phosphoric acid output was also relatively high but its proportion to the total nitrogen remained as before. It may therefore

be assumed that the fall of the leucocytes in our case was not the result of increased destruction but more probably of diminished production.

"During the last few months brief reports of urinary analyses in the course of the X-ray treatment of leukæmia have been recorded. Rosenberger found a diminution in the uric acid while the leucocytes were falling. Schleip and Hildebrandt found that the variations in the amount of uric acid passed were so great no conclusions could be drawn. Strumpell, Joachim and Kurpjuweit, and Lossen and Morawitz (in one fatal case) demonstrated an increase in the uric acid while the leucocytes were falling. The bulk of the chemical evidence, however, is in favour of the view that the X-rays exert an inhibitory action on the haemopoietic organs. What effects do the rays produce on the leucocytes and uric acid output of healthy persons? In this connection Bloch has recently reported a rise of the uric acid with a fall of the leucocytes in a case of chronic eczema exposed to the X-rays. As this is merely an isolated observation it would not be desirable to draw any definite inferences at this stage. The subject demands further investigation."

Ledingham brings forward the query as to whether or not the autopsical findings in his case can be reconciled with the changes found in the haemopoietic organs of experimental animals by other observers and discusses the matter as follows: "The absence of Malpighian follicles in the spleen is a common feature in chronic spleno-medullary leukæmia and hence cannot be regarded *per se* as the result of radiotherapy. The great scarcity of lymphoid elements in the spleen pulp is certainly a conspicuous feature but the most remarkable change is the sub-

stitution of proliferating undifferentiated basophile myelocytes for the fully formed neutrophile elements which one usually finds in the spleen of chronic spleno-medullary leukæmia. In cases of acute leukæmia these cells have been found in active proliferation in the bone marrow, spleen, and lymph glands (*vide* Aubertin) and one might presume that the real cause of death was an attack of acute leukæmia superposed on the chronic form during the leucopenic stage. The condition, however, permits of another, and to me more probable, explanation. During the first series of X-ray seances the percentage of cells of the neutrophile series rose (the increase affecting the polynuclear elements), while the lymphocyte percentage fell. After the suspension of the rays in August the lymphocyte percentage fell, but the change was only transitory. When the total leucocyte count was approaching normal limits the polynuclear percentage fell markedly while the lymphocyte percentage rose. So long as a relatively high leucocyte count obtained, the main effect of the X-rays would be on the lymphocyte series, as Heineke noted. Now, from the histological appearances it would seem that the spleen and lymph glands were the hæmopoietic organs most actively functioning. Thus, in spite of the inhibitory action of the rays on the myeloid function of the spleen there would result, owing to the destruction of the more susceptible lymphocytes, a relative increase of fully formed polynuclear cells in the circulating blood. When, however, the leucopenic stage intervened during the second series of seances, the ever-increasing tendency to diminished production must have considerably curtailed the myeloid function of the spleen or its power of sending

forth into the circulation more or less fully formed neutrophile cells. Moreover, what one might call the Mosse and Milchnes effect already referred to would come into play. Hence the presence in such numbers of these basophile indifferent cells in the spleen and glands, accompanied by a diminution in the fully formed neutrophile cells of the circulating blood, might not be so unexpected a phenomenon. Whether such a spleen would serve the organism more beneficially than a more fully developed myeloid organ is difficult to decide. Most probably it would not, as undoubtedly the needs of the body would be better served by an organ whose power of manufacturing and sending into the blood stream an excess of fully developed neutrophile cells was well maintained.

"The above considerations lead me to think that in the interests of the patient it would be advisable to exercise the greatest caution in continuing X-ray treatment once the total leucocytes have attained normal limits. This is all the more necessary when one remembers the startling results of Halber and Linser's experiments which, though still lacking confirmation, suggest to us the greatest circumspection in the employment of radio-therapy under the conditions indicated; indeed, in the very few recorded cases of leukæmia which have ended fatally during or after X-ray treatment the effects of leucotoxic products or liberated ferments have been assigned as exciting causes. As yet the only fatal case in which an accurate histological examination of the organs has been made is that recorded by Lossen and Morawitz. Krause reported shortly in one case that it was impossible to demonstrate in the hæmopoietic organs changes which are not usually associated with leukæmia, and Lommel

who examined the spleen in a case of pseudo-leukæmia which had been exposed to the rays, noted that the organ was very poor in lymphocytes.

"Lossen and Morawitz's case did not respond satisfactorily to the X-rays. The leucocytes were profoundly influenced but the general condition did not improve. The histological changes they reported were briefly as follows. The spleen pulp showed a great scarcity of leucocytes, especially of myelocytes and lymphocytes. Fibroblasts were numerous. The lymph glands were also greatly deficient in lymphatic elements. The marrow especially showed great hypoplasia with regard to its myeloid and lymphatic elements. The interstitial tissue of the marrow was also increased. As a result of their findings the authors believe that in certain cases the X-rays may give rise to a recognisable hypoplasia of the blood-forming organs. No satisfactory explanation has yet been given of the enormous improvement which almost invariably occurs in the general condition of the patient under the X-rays. It is at least difficult to bring it into relationship with the blood changes. Of course, on the assumption of Senn and Ahrens that the X-rays inhibit the development of, or actually destroy, the hypothetical parasite of leukæmia (Lowit), this improvement in the general condition would find ready explanation.

"Certain investigations (to be recorded elsewhere) which I have made on the role played by the leucocytes of spleno-medullary leukæmia in the process of phagocytosis of bacteria have shown that in the leukæmic serum the substance preparing the bacteria for ingestion by the phagocyte ("opsonin" of Wright and Douglas) is generally in normal amount as measured by normal

leucocytes, while a very much lower index is obtained when measured by the patient's own phagocytes. The myelocytes have exceedingly feeble phagocytic power and hence any factor that increases the number of ripe polynuclears in the circulating blood must also render the normal supply of opsonin more available for purposes of efficient phagocytosis and removal of effete matter from the tissues. It may be noted that in chronic lymphatic leukæmia the conditions appear to be reversed. At least in the two cases which I had the opportunity of examining frequently the polynuclear leucocytes, though constituting only two or three per cent of the total, had almost double the phagocytic power of leucocytes of healthy people. In these cases the true opsonic indices as measured with the patient's own serum and phagocytes were relatively high. In performing these tests staphylococci and tubercle bacilli were employed."

**Leprosy in the Philippines, with an Account of Its Treatment with the X-ray.** (*H. Brookman Wilkinson, Jour. A. M. A., February 3, 1906.*) Wilkinson describes leprosy as it exists in the Philippines, and especially the results of the Roentgen treatment of the disease. The exact method of the spread of the disorder is obscure and he concludes from his observations that it is rarely, if ever, transmitted from parents to offspring, and is with difficulty transferred from one person directly to another, but that frequently there seems to be a common source of infection to which members of the same family may be subjected, especially during early childhood. In the atrophic variety skin examinations for the bacillus may be

negative though the organism may be found in the nerves supplying the affected parts.

Roentgenization was tried on thirteen patients and the results are given. The applications were made on the most affected portion of the body, they were continued usually for ten minutes, at a distance of from seven to ten inches. The distance and time of exposure were occasionally varied, the effort being made to approach as near as possible the point of burning without actually causing a burn. If burns occurred the treatment was suspended for a time, and they readily healed.

Three of the patients are reported cured. One of these has died and the histologic and bacteriologic examination revealed no evidence of leprosy existing at the time of his death. The other two are apparently permanently free from the disease. Seven patients are improved, there being marked decrease of leprotic deposit and the advance of the disease being apparently checked. Three patients remain unimproved. The cases in which recovery took place are reported in detail. One patient is still under treatment, though the manifestations of the disease have disappeared and search for the bacilli results negatively.

Wilkinson is inclined to think that

roentgenization cures by killing the bacilli, the bodies of which are absorbed and thereby produce an immunity against the living organism, the process being analogous to that in plague, in which immunity is produced by injecting killed cultures of the plague germ. In support of this he cites the following: The treatment of one leprous spot causes a parallel improvement in distant and untreated parts which is as complete as in the part directly treated. The best results seem to be obtained only when treatment is pushed to the point of killing or beginning to kill the tissues which would probably also be the death point of the organisms. Patients with localized massive leprous deposits are most rapidly improved. In these cases there is an abundant culture for the rays to act on, the more quickly to produce immunity.

In patients with diffuse general involvement of slight degree, or of an atrophic character, with only a few scattered germs, Wilkinson has had little success. In two well-advanced cases with excessive new leprotic tissue, the improvement was marked and rapid, but was accompanied with a deterioration of the general health and rapid physical decline. This, might however, have been the result of an over-dosage of necrotic elements.

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## DIETOTHERAPY

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**The Food Factor in the Paroxysmal Neuroses.** (*Francis Hare, London Practitioner, February, 1906.*) Many believe that the common paroxysmal neuroses, migraine, asthma, epilepsy, etc., may all be explained by pathological variation of vaso-motor action, with

or without the addition of variations in cardiac action. In the malarial paroxysmal neuroses, the pathological vaso-motor action depends on the pathological condition of the blood, namely, the malarial toxæmia. This suggests the probability of a common humoral factor

in the non-specific paroxysmal neuroses.

Certain general characteristics are common to migraine, asthma and epilepsy. All are apt to be preceded by a period of indifferent health, or of bodily or mental discomfort, and to be succeeded by a period of restored, or even accentuated, well-being, physical and psychical. All are apt to be infrequent in proportion to their severity, frequent in proportion to their mildness. All are interchangeable or mutually replaceable. All tend in a sense to be monopolistic, since no two of them, except rarely, and then in quite modified form—continue to recur concurrently in the same individual.

These common characteristics naturally led to the conception of alternate accumulation and discharge. Edward Liveing assumed an irregular accumulation and discharge of "nerve-force." If we enlarge our clinical horizon, we shall find that another recurrent affection, acute articular gout, manifests the same phenomena illustrating accumulation and discharge, as are observed in the paroxysmal neuroses. It seems reasonable to suppose that the accumulations and discharges are similar in all four diseases. It does not seem reasonable to suppose that gout depends upon the accumulation and discharge of "nerve-force." In three of these paroxysmal affections—acute gout, asthma and major epilepsy—there is an unmistakable discharge of carbonic acid.

In migraine there is very marked restriction in the carbonaceous intake, on account of anorexia, and also of the arrest of the movements of the stomach, the secretion of the gastric juice, and of the process of absorption. Since combustion is continuous during life, it is obvious that a cessation of income, equally with an increase of expenditure,

would conduce to the dispersion of a prior accumulation. There would be a virtual, though not an actual, discharge of carbonaceous material during such migraine paroxysms.

On these considerations is based the hypothesis that the recurrent affections—migraine, asthma, major epilepsy, and acute articular gout—depend primarily upon an accumulation of unoxidized, or imperfectly oxidised, carbonaceous material in the blood; and that each paroxysm is a conservative measure adapted to disperse such accumulation.

The blood is being supplied at frequent intervals, if not indeed continuously, from the alimentary canal with both nitrogenous and carbonaceous material. It is improbable that the nitrogenous material accumulates to any extent within the system. On the other hand, it is known that the carbonaceous material is capable of accumulating in the system. Such accumulation does not invariably occur in the extravascular tissues in the form of fat, glycogen, etc., but may in some circumstances accumulate within the general bloodstream. This may constitute a frequent factor of pathological action. The condition of the blood containing such an accumulation of carbonaceous material may be designated as "hyperpyrexia."

The carbonaceous income of the blood depends upon the carbonaceous intake, and upon the efficiency of the functions of digestion and absorption. The carbonaceous expenditure of the blood is regulated to some extent by the carbonaceous income, but it depends absolutely upon the efficiency of the functions of combustion, anabolism and haemorrhage.

There is much evidence to show that whatever tends to reduce the carbona-

ceous income, or increase the carbonaceous expenditure, of the blood, tends to prevent, alleviate, or disperse; whatever tends to increase the carbonaceous income, or decrease the carbonaceous expenditure, of the blood, tends to initiate, precipitate or intensify the paroxysms of migraine, asthma and epilepsy.

1. *Hæmorrhage* involves a direct loss of carbonaceous material. Menstruation, the only physiological form of hæmorrhage, is one item in the carbonaceous expenditure of the blood. Suppression of menstruation has often been followed by the commencement, recrudescence, or intensification of migraine, asthma and epilepsy. The restoration of the function has often been successful in the treatment of all three affections.

2. *Anabolism*. Under this head come utero-gestation, lactation, and fat-formation. All are important items in the carbonaceous expenditure of the blood. Many migraines, asthmas, and not a few epilepsies, remain in complete abeyance from the commencement to the end of pregnancy, and this condition may continue during lactation. Similarly it has often been observed that the rate of fat-formation has a distinct inverse relation with migraine and asthma, if not with epilepsy.

3. *Combustion*. The main item of the carbonaceous expenditure of the blood is combustion. This is at its minimum in the small hours of the morning. It is well known that the paroxysms of migraine, asthma, and, to a less extent, of epilepsy, are peculiarly apt to commence at this time. In those who work at night and sleep by day the conditions are reversed, and a reversal of the pathological phenomena may be observed.

Physical exercise increases combustion, and is one of the most potent of all therapeutic measures for preventing and diminishing the length, severity and frequency of the paroxysms of migraine, asthma and epilepsy. Conversely, the commencement of these neuroses dates, not infrequently, from the abandonment, sudden or gradual, of some habitual physical exercise. The same observation was made by Sydenham in the case of gout.

Pyrexia involves great increase in the rate of combustion. Asthma and epilepsy tend to cease during the course of intercurrent pyrexia.

4. *Absorption*. Conditions which accelerate the rate of the alimentary current in the intestinal canal restrict absorption. This explains the usefulness of purgatives in the treatment of migraine, asthma and epilepsy.

5. *Digestion*. Dyspepsia often alternates with migraine and asthma, if not with epilepsy, because it interferes with absorption, and consequently it diminishes the carbonaceous income of the blood.

A material reduction of the proteid intake reduces the efficiency of the digestive process. Thus, a due restriction of proteid would tend to disperse hyperpyræmia. This explains the success of vegetarianism in the treatment of migraine, asthma and epilepsy.

6. *The Carbonaceous Intake*. Restriction of this may best be achieved, (1) by cutting off sugar; (2) by carefully graduating the daily intake of starch-containing foods, so as to attain the minimum consistent with adequate nutrition; (3) by similarly graduating the intake of fats; (4) by throwing the onus of nutrition to a considerably greater extent than previously upon

fish, lean meat, green non-starchy vegetables, and gelatinous soups.

Many cases of migraine, asthma and epilepsy have been materially benefited by such a regimen.

Clinical evidence seems to warrant the conclusion that hyperpyræmia is a common humoral factor, at least in some cases, of the special pathological variations of vaso-motor action which constitute migraine, asthma and epilepsy.

The humoral, however, is but one of a number of etiological factors involved in these neuroses, and other factors are, in many cases, more important, and therefore more worthy of primary therapeutic attack.

Furthermore in some cases the hyperpyræmia must be regarded as merely a relative, not an actual, hyperpyræmia, the implied carbonaceous accumulation being pathological in amount only as regards the pathological function concerned, but physiological as regards the functions of the organism generally. This depends no doubt, on the dominance in such cases, of factors other than humoral.

**Facts about Eating.** (*John Warren Achorn, American Medicine, February 17, 1906.*) We eat, or should eat, to keep the blood pure and bright for the nourishment of all the tissues. If this can be done in an individual case on one meal a day, properly eaten, then one meal a day is sufficient; or two meals a day may be required, depending somewhat upon the age and occupation. Three meals a day are seldom needed by persons past fifty, who are engaged in intellectual pursuits.

Food eaten habitually in excess, or unfairly eaten, finally disorders the system or results in disease.

Sick headache (mixed migraine), bil-

iousness, hyperacidity, duodenal ulcer, spastic constipation, chronic rheumatism, bronchitis, asthma, postnasal catarrh, eczema, acne, pruritus (itching), neuralgia, insomnia, cerebral hemorrhage (apoplexy), arteriosclerosis (hardening of the arteries), Riggs' disease (loose teeth with retracted gums), frequent urination, physical weariness ("that tired feeling"), obesity in some of its forms, and many other ailments and conditions are amenable to, or can be ameliorated by, intelligent and persistent dietetic treatment.

When any of the foregoing disorders are present there is or has been overeating of some sort, too much eating of one kind of food, meals are taken too near together, there is "nibbling" between meals, the food taken is not being properly insalivated, it is being washed down by liquids in excess, taken with it or after meals independently of the food ingested.

Liquids habitually used in excess weaken the muscular power of the organ, and dilute the gastric juice during digestion. Not more than two glasses of liquid should be taken at a meal and but one when soup is eaten. Five hours after a meal is the best time to drink water freely, or one hour before the next meal. Four glasses of water a day, aside from that taken at meals, is the amount ordinarily indicated.

Liquid nourishment, taken between meals, before the stomach is empty, usually disturbs digestion. The practice of taking it is a bad one and should be avoided. The pernicious practice of taking iced, semi-solid food at soda fountains, between meals, cannot be condemned too earnestly.

The normal stomach empties itself in six hours, depending somewhat upon the meal. Meals are therefore better

served six or seven hours apart. It is a good plan to go without food during the hours of greatest mental activity, especially if there is any weakness of digestion.

In *sick headache*, *chronic rheumatism*, *arteriosclerosis*, and *Rigg's disease*, it is well to lessen the ingestion of starches, sugars and red meats, or other highly nitrogenous food. These foods raise the arterial tension, while sugars ferment.

In *headache*, *biliousness*, and *obesity*, the "no-breakfast" plan usually works well.

In *chronic bronchitis*, *asthma*, *post-nasal catarrh*, *eczema*, *acne*, *pruritus*, *physical weariness* and *obesity*, the starches and sugars should be curtailed. The metabolized waste of starch and sugar is eliminated by the lungs, and if taken in excess, clogs the connective tissues in them and in the bronchial tubes. A good combination for those who insist on sweet in some form is, sugar of milk, one pound, saccharin, one-quarter to one-half teaspoonful (dram), according to taste. Maple sugar is a good sweet, it is less irritating than granular sugar. Sterilized honey goes well in the morning (sterilize for half an hour in a double boiler).

In *eczema* and *acne*, the use of stimulating foods and beverages, such as tea, coffee, red meats and condiments, must generally be denied. A low tension, non-stimulating diet would be represented by twice-cooked cereals and fruit. In *scrofulous eczema* fats are indicated, while starchy foods act badly. In *acne* and *urticaria* fats do harm.

*Neuralgia* and *insomnia* yield to a carefully eaten restricted diet, insomnia generally in three weeks' time. The practice of giving milk, fruit or other

food at bedtime to induce sleep is undesirable.

*Spastic constipation* can be relieved usually by two meals a day, one of cooked fruit mainly and the other of vegetables. Fruit acts better when eaten alone. Apples, apricots, peaches, prunes, dates, raisins, and steamed figs may be used. Tomatoes and onions should have the preference among vegetables, while spinach, lettuce with oil, asparagus and cooked celery are beneficial. Rye bread is helpful, also gluten and bran bread.

*Obesity*, when not due to physiologic gluttony, will often be found associated with "nibbling" between meals, or with eating some one fattening food in too great quantity, or with the free use of liquid at meals, which, serving to retard digestion and circulation, favors the deposition of fat. Liquid with meals increases the desire for food. Green vegetables, freed from water, the harder they are to digest the better, by keeping the intestines busy, ward off appetite and burn up fat. Old vegetables may contain starch and prove fattening.

The *lean man* may not eat everything with impunity. He is equally liable to all of the diseases, except obesity, if he regularly overeats. He will often gain in weight if he eats less. Put a thin man on two meals a day, and instead of the usual breakfast, give him olive oil in grape juice, and the chances are he will speedily gain in weight. Add from one to four tablespoonfuls of olive oil to the juice of two or more oranges, mix thoroughly and eat slowly with a spoon.

Starches and sugars are the foods that common experience has shown are the most likely to clog the system. Meats or other foods require to be con-

trolled, depending on the indications. Often a diet, limited in the use of starches and sugars, is all that is required.

Greater restriction would be represented by a small cup of clear coffee in the morning, a bowl of beef or mutton broth at noon (a pint), and a glass of milk and vichy or of barley broth or whey at night. This is to be maintained for two or three weeks, when an

increase in the amount of food, or a return to solid food, may be made and gradually carried up to the point where the system balances, that is, the patient feels well and remains cured.

A coated tongue declares a foul stomach. A foul tongue calls for a restricted diet. Skin diseases yield reluctantly to local treatment as long as the tongue remains coated.

### AEROTHERAPY

**Clean Air.** (*T. Mitchell Prudden, Medical Record, February 3, 1906.*) We seldom realize what an enormous number of dust particles may be floating in the air of enclosed places, which, in a different light, seems clear and pure. But let a beam of sunlight fall through a small opening into the air, or cast a powerful electric light across the dusty space and an incredible number of minute particles may be seen dancing about forming indeed a sharp, luminous pencil made up of the rays reflected from each tiny mote. In his studies upon the floating matter in the air Tyndall found that these myriad dust particles, if enclosed in a tube, soon settle upon its sides and bottom and the enclosed air becomes as clear and moteless as are the inter-stellar spaces. This is, indeed, only a more refined form of the experiment which every house-keeper makes who closes the room after sweeping to allow the dust to settle.

Micro-organisms floating in the air as dust are sometimes single, more often in small clusters or masses joined together as they have grown, and are very apt to be clinging to some other forms of dust particles. It has been found that these micro-organisms obey the

law of dust particles in general and gravitate to the floor or to the upper surfaces of subjacent objects, the tables, window-seats, chairs, the floor of the room, etc.

Ventilation as ordinarily practiced has little effect in removing accumulations of dust whether containing pathogenic organisms or not. A draught of considerable force is necessary to eliminate the dust. The ordinary current of air flowing in from an open window or door is ineffective for this purpose, however useful it may be in the removal of gaseous contaminations. It has also been shown that the hanging of garments out of doors is insufficient to rid them of infective agents. Bacteria are not removed unless such articles are brushed, beaten, or shaken, or flap violently in the wind.

New and sinister possibilities of air infection have been brought to light by the investigations of Flugger and his assistants at Breslau. These observers found that not only in coughing and sneezing but also in ordinary speech, the secretions of the nose, mouth and throat may be cast forth in considerable quantities for a distance of several feet, not only in the form of visible

droplets, but as a more or less abundant, invisible spray, which may remain suspended for from half an hour to several hours, and may be carried for long distances on such slowly moving air currents as are common in inhabited rooms. The effect of walking over floors on which bacteria-laden dust has settled is to set large numbers astir, but in still air these do not commonly rise more than a few feet and then settle slowly back again. Dry sweeping of such floors sends clouds of germs into the air, contaminating it in every part.

Nature has mercifully provided us with many natural safeguards against the entrance into the economy and distribution to the tissues, of the pathogenic micro-organisms to which we are daily exposed. The moist surface of the tortuous nasal passages (not to speak of the capillary barriers which guard the entrances), the throat, larynx, and trachea, all produce more or less deposition of dust from the air in transit so that at the end of inspiration the air has been so far freed from its floating particles as to emerge in the expiration comparatively dust and germ free. The ciliary movement of the epithelium of the deeper air passages also tends to limit the entrance of dust as well as of mucus from the nose, throat, etc. Furthermore the growth of many micro-organisms is inhibited by the mucus of the air passages. It is probable that very few of the dust particles entering the respiratory passages ever reach the air cells. Even of those which succeed in reaching the tissues many are destroyed by the phagocytes and body liquids.

It must not be forgotten, however, that the efficiency of these safeguards may be greatly diminished if they are over-worked or abused. There are

many conditions under which the dweller in modern towns finds himself in which the air is heavily and almost continuously charged with dust, some of it undoubtedly derived from the infectious waste of diseased persons who through spitting or unguarded coughing or sneezing or in other ways have contaminated the air.

But whether under these unfavorable conditions one shall suffer from his exposure to these various disease incitants depends in the largest measure upon his physical condition. If the natural safeguards against infection through his respiratory organs are in good working order, if he be not predisposed through some physical disability to the incursions of such infectious microbes as may have survived the adversities of drying, sunlight, etc., to which his particular dose of dust has been subjected, then, indeed he may for months and years together sustain without obvious damage the burden of dusty and even infective air. This is in fact the good fortune of most city dwellers. But now and then, here and there, with one or another of the crowd the adverse conditions fit together and one or another falls victim to a preventable dust disease.

The prevention of aerial infection through floating dust presents a problem of two distinct parts: first, the prevention of the distribution of infective material in such condition that it floats in the air or may be converted into dust; and second, the practice of such methods of cleaning as shall ensure the removal or destruction of infective or other dust from inhabited places and especially from dwellings and indoor places of assembly. To ward off or to limit aerial infection, the sputum not only of pulmonary tuberculosis, but of influenza, whooping cough, diphtheria, various

types of pneumonia, different forms of mouth and throat lesions associated with streptococcus and staphylococcus and of cerebro-spinal meningitis should be carefully disposed of. In nearly all of these diseases exudates are cast off in varying amounts which contain virulent micro-organisms. Every person should also be instructed in the importance of holding a handkerchief in front of the mouth in the act of coughing or sneezing. Offenders against the anti-spitting laws must be ceaselessly and relentlessly pursued.

But even under the most favorable conditions there will always be a considerable disposal of infectious material in closely crowded communities and this brings us to the second part of the problem which relates to proper methods of cleansing and disposing of dust. It is important to bear in mind that if a room can be entirely closed for some part of the twenty-four hours so that the air is still the dust will practically all settle to the horizontal surfaces. If now we can remove it from these without stirring it into the air again we may once in the day at least start with relatively dust-free and germ-free air. If the room is uncarpeted it is easy by means of moistened saw-dust to sweep with comparatively little stirring of the dust. Then if two or three hours be allowed to pass with the rooms closed or still, what-

ever dust may have been stirred in sweeping will have again settled and by the use of moistened mops and moist or dry cloths it may all be removed. Dry sweeping is an abomination and the feather duster a delusion and a snare. If all such places in which it is practicable were properly swept at night after their occupants had left them, and then closed until morning, when, before the people returned, with moist mops and dust-cloths the floors and all horizontal surfaces were intelligently cleaned, with the purpose of removing and not simply stirring up the dust, there would be an immediate and far-reaching reduction of the dangers from infectious and other floating matter in the air. The carpeting of places of public assembly involves the presence of filthy and dangerous dust in the air. But here as in all carpeted places the use of moistened shreds of paper thrown upon the carpet and carried forward with the broom will be found most effective in gathering and holding the dust.

The author believes that a large part of the so-called disinfection might be replaced, to advantage, with proper methods of sweeping, dusting, and mopping, if these were not so simple and commonplace, and each person could and would realize the significance of floating dust in the conveyance of infectious agents.

#### MECHANOTHERAPY

[*Athletics for Young Women.* (*William Lee Howard, N. Y. Medical Journal*, February 3, 1906.) This is a very sensible article and especially appropriate at this time, when the attention of parents and physicians is strongly turned to the subject of athletics by the pro-

tests against football, which contest can no longer be classified as a game.

With the popularization of basket ball there has been a strong tendency to bring girls of high school age into competitive contests in athletics to a degree that must be harmful to the future

health of the contestants, and it is well for men like Dr. Howard to call attention to the unlikeness of boys and girls from a physiological standpoint and therefore the requirement of a different form of exercise to ripen them into the highest efficiency of mature life. The article states that boys from fourteen to eighteen years of age are essentially physiological units, while among girls of the same age will be found those who need absolute physical rest, others who need the careful advice of a physician, and others who require strong physical activity to submerge an excessive psychic energy which, if not directed into physical lines, will result in ruinous nervous excesses.

Girls should do no physical work except walking and swimming for the first year after puberty. The first is a natural form of exercise and should be taken in the country whenever possible, with hill climbing as a more vigorous form of the same normal movements that will call into play the respiratory tissues. Cold showers or sponge baths

are of great value to most girls and women but not unless there is a following glow and sense of exuberance.

Any form of exercise that causes undue psychic excitement, such as personal contests or games between rival schools, is too great a strain on a developing nervous system. The unavoidable excitement accompanying contests where efforts are strained to win from rivals, takes force and energy from growing nerve cells and the result can only be disastrous.

There is a lack of recognition of these facts seen in the management of the physical training departments of some of the schools and colleges where the individual need is not considered. Exercise is planned on the basis of the strong and healthy, and the weak in nerve power are expected to work with the strong and be benefitted even more than those for whom the exercise is adapted. The method is absurd and while it may produce a few athletes and gymnasts it will destroy the health of many women.

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## PSYCHOTHERAPY

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**The Localization of the Higher Psychic Functions, with Special Reference to the Pre-frontal Lobe.** (*Charles K. Mills and T. H. Weisenberg, Jour. A. M. A., February 3, 1906.*) After first sketching briefly the history and present status of the question of cerebral localization the authors bring forward the data and reasons for the belief that the pre-frontal lobe, *i.e.*, that portion of the brain anterior to the motor centers, and especially the left pre-frontal lobe, is the center for the highest psychic functions. First, they find much evidence of value

in support of this view in the studies of human and comparative morphology and anatomy. Brains of persons of known intellectual powers show a special development of this region, and if such brains are compared with those of human beings of low individual or racial development the psycho-physiologic importance of the pre-frontal region becomes more apparent. Exceptionally the left lobe has not the highest development as compared with the right, and in studying the conditions a careful comparison should be made between the gyral and

fissural characteristics of the pre-frontal and parieto-temporo-occipital areas.

Morphologic studies of the brains of imbeciles support the theory of the higher psychic functions of the anterior lobes, and the embryologic studies of Flechsig and the histologic researches of Campbell show, among other things, the absence of projection cells and fibers in this region of the brain. Campbell speaks of it as the very last pallium to appear in the progress of phylo-genesis, which is in accordance with the view here expressed, as the highest and most specially endowed portions of the nervous system are the latest to appear. Gross and microscopic examinations of the brains of general paretics afford support to this view, and it is probable that a careful study in cases of dementia *præcox* will also afford like evidence.

If the pre-frontal lobe is the seat of the higher psychic action, the suggestion naturally occurs whether it can be subdivided into sub-areas or centers. The difficulty of answering this question is evident, but the authors suggest as a possible clue the position of certain known motor centers that are most clearly associated with psychic functions such as those for speech and for the movements of the head and eyes, which project from the pre-central convolution into the pre-frontal lobe. They criticise the work of certain authors who have questioned the psychic function of the pre-frontal lobes and point out their fallacies and defective methods of study. The paper concludes with the report of a case of tumor of the pre-frontal lobe bearing on the subject here discussed. The article is illustrated.

### CLIMATOThERAPY

**The Therapeutic Merits of the Arctic Climate.** (*Frederick Sohon, Jour. A. M. A.*, February 3, 1906.) In this contribution Sohon presents the meteorological data of a summer cruise to the Arctic region aboard the steamship "Erik," the auxiliary vessel of Commander Peary's present polar expedition. The observations were begun July 17th, and ended September 5th, 1905, and comprehend the time consumed in the voyage from Sydney, Nova Scotia, as far north as 78.5 degrees N. latitude, and the return journey to St. John, New Brunswick.

From August 1st to 9th the vessel was at anchor in North Star Bay, latitude 76.5 north, a small basin bending in from Worstenholm Sound, eight

miles from where the latter debouches into the open sea; and from August 13th to 23d just within the entrance of Etah Fjord, latitude 78.5 degrees north, which is protected by high hills and warm rocks on either side.

The temperature readings were taken at 8 A.M., 12 noon, 4 and 8 P.M., and at 12 midnight, or what corresponded to midnight. The thermometers were shaded and sheltered twelve feet above the side of the vessel to eliminate, as far as possible, errors which might be caused by heat from the vessel.

The chart shows that the extreme daily range was from thirty-five degrees F. low, to sixty degrees F. high. The low mark was touched but twice and the high only one time. The customary

daily range was from forty degrees F. to fifty degrees F., the mercury seldom passing beyond either of these limits. On a number of days the daily variation was only two or three degrees, the mercury remaining at almost the same mark at each observation.

The extreme range of relative humidity varied from 28.08 per cent to 95 per cent. Almost all the high percentages were observed when the vessel was at some distance from the land. At the two high Arctic points, North Star Bay and Etah where the vessel tarried, a low relative humidity was the rule. The author presents a table showing the comparative humidity percentages of several American cities and these two Greenland places mentioned.

	Maximum Humidity.		Minimum Humidity.		Average Humidity	
	8 a.m.	8 p.m.	8 a.m.	8 p.m.	8 a.m.	8 p.m.
New York .....	100	95	62	50	81.3	74.4
Washington.....	100	93	65	56	84.8	79.1
Los Angeles.....	100	80	52	23	88.1	62.1
Denver .....	90	90	41	13	66.1	37.1
Phoenix .....	88	50	43	15	59.0	25.2
North Star Bay:	72	71	56	39	63.1	54.0
Etah .....	81	70	40	35	57.6	52.4

The table shows, that the atmosphere of the latter places was never as moist as it was during the night and morning hours in each of these cities; it was never as dry as it became in three of them in the middle of the day; the range of variation was decidedly less and the actual amount of contained moisture smaller.

During the passage north in the first week of the cruise the weather conditions were rather worse than those usually met with at the same season in southern waters. Fogs, light rains, and overcast skies were encountered. But the stay at the two anchoring points was characterized by ceaseless sunshine and a bright, clear atmosphere. No record of the wind movement was made at

either place. Rains appear to have been entirely absent. As a result of these climatic data and of other considerations Sohon believes the Arctic region may present a favorable summer sanatorium for the treatment of early pulmonary tuberculosis. From a careful study of the paper we may summarize the advantages of a summer cruise to Greenland as follows :

*First.* As to access. We have the authority of Commander Peary, based on an experience of nearly fourteen consecutive Arctic summers, that there is nothing more arduous in a voyage to this region than in the voyages which are now undertaken each year by tourists to the North Cape and Spitzbergen.

*Second.* The possibility of having a continuous period of sunshine without the intervention of an hour of night for upward of three months. After the long Arctic night Dame Nature wears her blandest smile in the brief period of summer. Vegetation thrives wonderfully, the native animals are the largest of their kind, and in common with their human neighbors, the Esquimaux, they quickly become fat and plethoric and accumulate a surplus of adipose to carry over into the following winter.

*Third.* As the Arctic air contains no dust and the actual amount of contained moisture is small it remains cool, even under the ceaseless sunshine. This gives it a bracing quality that is not felt as cold, and allows the sojourner to be comfortable without overcoat or gloves, or even to sleep safely out of doors if he is so disposed. The Arctic summer is pleasant and exhilarating; it is not warm enough to enervate and is just cool enough to be refreshing and to invite an invigorating life.

Other Arctic travelers agree with

Sohon's conclusions relating to the Arctic summer climate. Professor Nicholas Senn, who took the journey on the Erik, states that Nature in the Arctic "bends such efforts toward prophylaxis as to leave no need for therapeutics."

Dr. F. S. Nash, Surgeon U. S. Navy, who was one of the medical officers of the Greeley Relief Expedition and after-

ward surgeon of the Northern Alaska Exploring Company, heartily endorses Sohon's statements. Mr. H. L. Bridgeman, a traveler of wide experience who has visited the points where the foregoing records were taken, considers them eminently suitable for a summer sojourn by consumptives. General Greeley and Mr. W. S. Champ also agree with the author's conclusions.

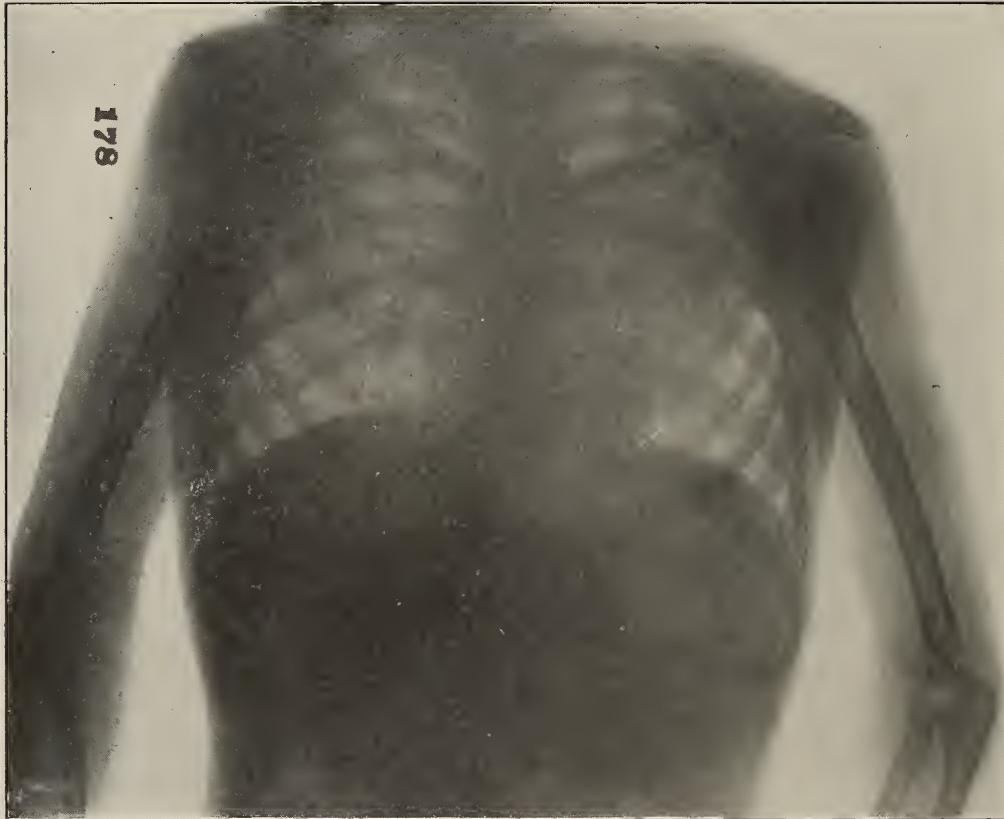
# The Archives of Physiological Therapy

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SPECIAL PLATE LIII

CHEST OF CHILD NINE YEARS OF AGE

Note especially the sharp outline of the heart (pulse was beating 120 times per minute). See also the blood-vessels of the lungs and an area of pulmonary consolidation to the left of the heart.

Made in the prone position with 20-inch Roentgen coil exciting a Machlett water-cooled tube with the anode 18 inches from plate, exposure 1-10 second.

By Dr. George Edward Pfahler, of Philadelphia, Pennsylvania.



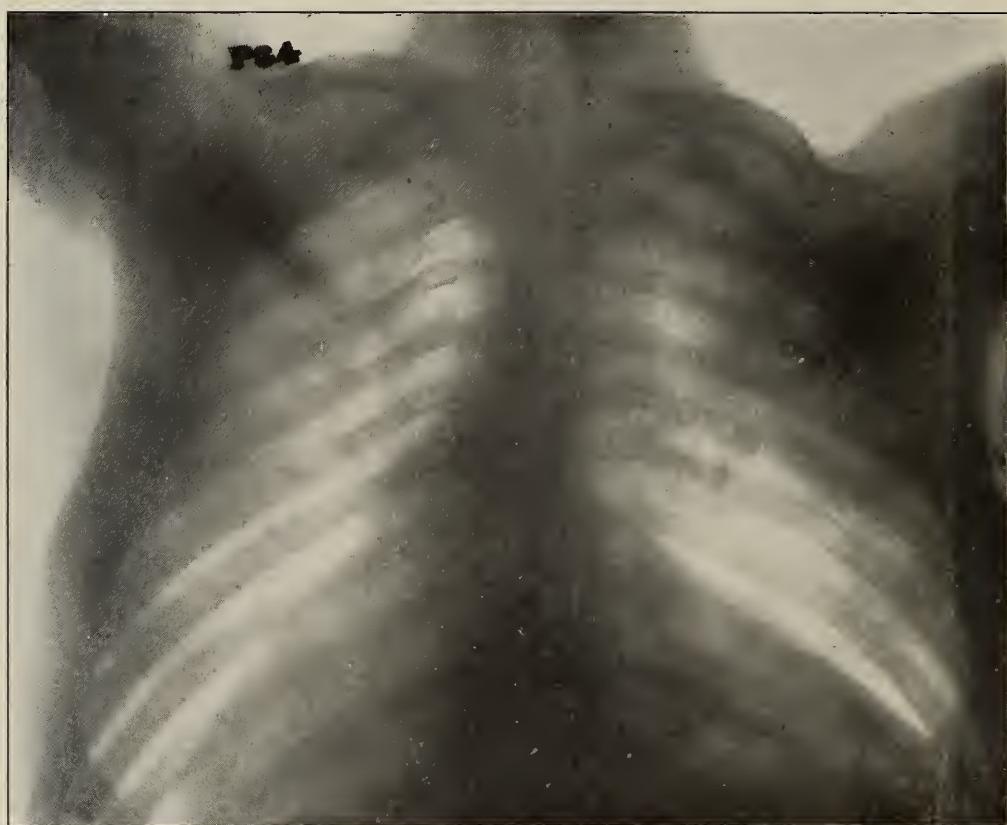
SPECIAL PLATE LIV

RIGHT KIDNEY REGION OF A NUDE MAN WEIGHING  
TWO HUNDRED POUNDS

See stones in pelvis and lower portion of kidney.

Made with a 20-inch Roentgen coil exciting a Machlett tube with the anode 18 inches from the plate, through a diaphragm, exposure 10 seconds while the patient held his breath. Edinol and Hydrochinon developer.

By Dr. George Edward Pfahler, of Philadelphia, Pennsylvania.



SPECIAL PLATE LV

PULMONARY TUBERCULOSIS WITH COLLAPSE OF  
LOWER PORTION OF RIGHT LUNG

Made in the supine position with an 18-inch Roentgen coil exciting  
a Machlett tube with the anode 18 inches distant from the plate,  
exposure 12 seconds. Edinol and Hydrochinon developer.

By Dr. George Edward Pfahler, of Philadelphia, Pennsylvania.

# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

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## THE ROENTGEN TREATMENT OF HODGKINS' DISEASE, LEUKAEMIA AND POLYCYTHEMIA\*

BY HENRY K. PANCOAST, M.D., OF PHILADELPHIA, PENN.,

*Lecturer on Skiagraphy, and Assistant Instructor in Surgery at the University of Pennsylvania, and Skiographer to the University Hospital*

PREVIOUS to the discovery of the value of the X-ray as a therapeutic agent, certain diseased conditions referable to the blood and blood-making organs, especially leukæmia and Hodgkins' disease, were regarded as diseases for which there was no drug that could be claimed to act as a "specific." Arsenic was probably the most reliable remedial agent which seemed to have much value in combatting them, real cures were infrequent, and the action of this drug was uncertain and variable. It is particularly with leukæmia that we wish to deal in this paper, and it is certainly of great interest to us, as well as to the medical profession at large, to know that the X-ray has been found to have by far the greatest value of any therapeutic agent yet discovered, in its action against this disease.

On account of the large and steadily

increasing numbers of the earlier cases reported as "cured" under X-ray treatment, we were all led to believe that a reliable specific therapeutic agent had been found. Little was known of the action of the rays upon the tissues concerned, and the possibility of relapses was given but slight attention. The wonderful results obtained seemed almost as remarkable, if not more so, than those accomplished in the treatment of superficial cancers and lupus. It was surely justifiable to regard this new method of treatment as a "specific," but as later reports have begun to show an exceeding frequency of relapses, that ultimate death often follows a supposed cure, and that there are serious dangers attending an indiscriminate use of X-rays, conservative men are beginning to look upon the Roentgen specialist as over-enthusiastic in his claims, and perhaps with some justice,

\* Read at the Sixth Annual Meeting of the American Roentgen Ray Society at Baltimore, Md., September 28-30, 1905.

but at the same time, these very men are perfectly willing to acknowledge that the X-ray has great value, is the most reliable agent in treating leukaemia, and do not hesitate to submit all such cases to this form of treatment.

Recent investigations in regard to the effect of X-rays upon the metabolic processes, and especially as to their action upon lymphatic tissue and bone marrow, have somewhat additionally justified a conservative feeling, and at the same time have added renewed interest to the subject of X-rays and radio-activity. These researches would seem to have led us almost, if not quite, up to the brink of the discovery of the real action of this form of energy upon cell life and metabolism, and the ultimate factor in its curative and its destructive powers.

I am indebted to Dr. John H. Musser for the privilege of reporting two cases of spleno-medullary leukaemia referred by him for treatment in the X-ray laboratory of the hospital of the University of Pennsylvania. I am also indebted to Dr. David L. Edsall for notes on the experiments\* in metabolism carried out in these two cases particularly, and in some others to be referred to in conjunction. Brief notes of the history and treatment of these patients follow :

*Case I.*—E. C. H., male, white, forty-four years old, plumber, married. Admitted to the University Hospital, September 15, 1904. The family history and previous personal history have no bearing on the case. During March, 1904, six months before admission, he began to notice a loss of strength, which was gradually progressive. Mental irritability and occasional attacks of diarrhoea were the only other symptoms

noted up to the date of admission. The important points brought out in the examination at that time were as follows :

Weight, one hundred sixty-eight and a half pounds.

Measurement of spleen,—on the anterior axillary line, from the seventh rib above to three inches below the level of the umbilicus. Anteriorly it extended nearly to the median line, the greatest length was twelve and a half inches, and the greatest breadth thirteen inches.

The liver was not enlarged.

The inguinal and axillary lymphatic glands were palpable, but not enlarged to any extent.

*Blood examination:*

Haemoglobin .....	38 per cent
Red cells.....	4,280,000
Leucocytes .....	407,500

The differential count one week later was as follows :

Myelocytes .....	49.2 per cent
Polymorphonuclears .....	27.1 "
Transitions .....	21.6 "
Eosinophiles .....	1.0 "
Lymphocytes .....	0.2 "
Nucleated reds .....	0.8 "

X-ray treatment was started September 15, 1904, and until October 24 the applications were made almost daily, making thirty-seven during that time. These exposures were made over the entire abdomen and most of the thorax, with the tube usually over the splenic area, but its position was changed from time to time as any signs of dermatitis appeared. The arms were occasionally included. A rather hard tube was used, with a resistance equal to three to four inches of spark gap, and the anode was placed from twelve to sixteen inches from the surface of the body. A current of two to two and a half milliamperes in the secondary was furnished by an

\* A full report of these experiments was made in a joint paper by Dr. Musser and Dr. Edsall, read at the meeting of the Association of American Physicians at Washington, D.C., May 16 and 17, 1905. The article will appear in print later in "The University of Pennsylvania Medical Bulletin."

eighteen-inch coil and electrolytic interrupter. The first exposure lasted three minutes and this time was later increased to six and eight minutes. The lower extremities were exposed for three minutes in addition at each treatment.

After twenty-five applications the patient had improved sufficiently to return home (October 12). At that time the leucocyte count was 138,000, and the spleen had decreased greatly in size. He returned daily for his treatments until thirty-seven had been given. A very marked erythema appeared over the entire abdomen at this time, and for this reason and on account of the improvement in his condition, the exposures were continued four times a week. The leucocyte count was then 37,000. While the dermatitis lasted, the applications were made to the right side and back.

At the end of fifty-two treatments (November 26) the spleen was scarcely palpable, and the leucocyte count was normal. The exposures were then continued once a week until February 15, 1905, at which time sixty-six applications had been made, extending over a period of twenty-one and a half weeks. The spleen was then not palpable, the leucocyte count was 6800, and the patient weighed one hundred eighty and a quarter pounds, a gain of twelve pounds. He had also recovered his strength, and was able to attend to his work. He was considered cured, but was told to come back in ten days, as it was thought advisable to make an occasional exposure as a preventive measure against recurrence.

He did return in ten days (February 25), and complained of not feeling well, and said he ached all over and thought he had taken cold. The spleen was

found to extend one and a half inches below the costal margin on deep inspiration, but could be pushed up under the ribs during expiration. The leucocyte count was about 80,000.

Active treatment was at once started, and three exposures of ten minutes each to the thorax and abdomen, and three minutes to the lower extremities were made each week. In spite of this, he grew progressively worse and was admitted to the hospital for the second time, March 12, 1905. He was then having chills, and running a temperature as high as one hundred and one degrees F., the spleen was considerably larger, and he felt very weak. The leucocytes numbered 180,400 and the differential count made by Dr. T. C. Kelly was as follows :

Basophiles .....	4.0 per cent
Lymphocytes .....	4.0 "
Polymorphonuclears .....	18.0 "
Eosinophytic myelocytes ..	2.5 "
Neutrophilic myelocytes ..	71.5 "

After admission, three daily treatments were given, and then from March 14 to 23 exposures were discontinued because it was feared that the X-rays might be doing harm. Metabolism investigations were started during this interval. The patient rapidly became worse, was very much prostrated, the fever continued high, retinal hemorrhages occurred; the spleen became larger and the leucocytes rapidly increased. From March 23 to 30 daily exposures were made, but the patient did not respond to them. On the 29th the leucocytosis had increased to 496,000, and he died suddenly April 1. Unfortunately no autopsy was allowed.

This case is interesting from many points of view. After making sixty-six X-ray exposures during a period of twenty-one and a half weeks, the patient

was thought to be cured, but during a short period of ten days he developed symptoms of an acute relapse, and died five weeks later, despite X-ray treatment. The metabolism investigations made during this relapse will be mentioned later, in connection with the second case.

The accompanying table, copied roughly from a chart prepared by Dr. Thomas C. Kelly, shows the blood findings before and after each X-ray treatment of the first attack, from September 15 to November 22, 1904.

Hæmoglobin	.....	38 per cent
Erythrocytes	.....	4,280,000
Spleen	.....	$12\frac{1}{2}$ ins. x 13 ins.

Before roentgenization	After roentgenization
Sept. 15—407,500	390,000
Sept. 16—395,000	362,000
Sept. 17—370,000	455,000
Sept. 18—657,000	490,000
Sept. 19—417,000	472,000
Sept. 20—305,000	290,000
Sept. 21—357,000	347,000
Sept. 22—457,000	247,000
Sept. 23—320,000	332,000
Sept. 24—455,000	427,000
Sept. 25—370,000	392,000
Sept. 26—490,000	322,000
Sept. 27—515,000	390,000
Sept. 28—440,000	350,000
Sept. 29—365,000	335,000
Sept. 30—362,000	347,000
Hæmoglobin	..... 42 per cent
Erythrocytes	..... 4,000,000
Oct. 1—387,000	287,000
Oct. 2—285,000	275,000
Oct. 3—335,000	347,000
Oct. 4—287,000	260,000
Oct. 5—217,000	235,000
Oct. 6—240,000	340,000
Oct. 7—285,000 spleen	$11\frac{1}{2}$ x 9
Oct. 8—215,000	237,000
	202,000

Oct. 9—240,000	177,000
Oct. 10—185,000	230,000
Oct. 11—198,000	147,000
Oct. 12—167,000	190,000
Oct. 13—200,000 left hospital	138,000
Oct. 14—152,000	148,000
Oct. 15—152,000	102,000
Oct. 16—127,000	135,000
Oct. 17—100,000	130,000
Oct. 18—75,000	80,000
Oct. 19—138,000	73,000
Oct. 21—62,000	57,000
Oct. 24—70,000	37,000
Oct. 26—45,000	42,000
Oct. 29—35,000 spleen 7 ins. x $7\frac{1}{2}$ ins.	
Hæmoglobin	..... 70 per cent
Erythrocytes	..... 4,000,000
Nov. 22—17,000	
Hæmoglobin	..... 70 per cent
Erythrocytes	..... 4,500,000
Nov. 4—24,000	
Hæmoglobin	..... 88 per cent
Erythrocytes	..... 5,000,000
Nov. 6—20,000	
Nov. 8—14,000	
Nov. 22—10,000 spleen 4 ins. x $2\frac{1}{2}$ ins.	

*Case II.*—Mrs. L., white, forty-two years, married. Admitted to the University Hospital March 20, 1905. The family history and previous personal history have no bearing on the case. The first symptoms of the present disease became manifest about October, 1903, eighteen months previous to admission, when she noticed that she tired easily, lost weight, and her skin took on a "greenish hue." Later, there followed a sensation of fulness, accompanied by pain and tenderness, over the splenic area, and a palpable mass was easily felt below the ribs. She was treated medicinally and improved, and in the spring of 1904 she had gained thirty pounds in weight and felt perfectly well. She was then regarded as cured.

Her good health was maintained until

October, when a relapse occurred, one year after the beginning of the first attack. She dates this recurrence from a severe hemorrhage lasting nine hours following the removal of a small cyst from an eyelid. Though the incision was small, she lost sufficient blood to cause a mild shock. Whether this was the starting point or not, the spleen began to enlarge almost immediately, and there followed an onset of general symptoms similar to those present in the attack one year previous. All the symptoms became slowly but progressively worse up to the time of her admission to the hospital, March 20, 1905. The important points brought out in the examination at that time were as follows:

Measurement of spleen,—on the anterior axillary line, from the seventh inter-space above to within one inch of Poupart's ligament below. Anteriorly it extended one inch beyond the median line. The surface was smooth and the right border notched below the costal margin, and there was tenderness over this border.

The superficial lymphatic glands showed no enlargement.

The liver was not enlarged.

*Blood examination:*

Hæmoglobin .....	68 per cent
Red cells .....	3,410,000
Leucocytes .....	245,000

The differential count made by Dr. Kelly was as follows:

Neutrophilic myelocytes .....	45.0 per cent
Basophilic myelocytes .....	16.0 "
Eosinophiles .....	3.0 "
Polymorphonuclears .....	26.0 "
Lymphocytes .....	9.0 "

The urine contained a trace of albumen and some casts.

The patient was pale, weak, and emaciated.

X-ray treatment was started March 26, 1905, when the leucocytosis was 304,400. From the start the treatment was pushed more vigorously than in the first case, and exposures were made daily until April 20, twenty-six applications being given during this time.

The abdomen and lower two-thirds of the thorax, and occasionally the arms, were exposed, but the pelvis was protected, as is advisable when possible in treating a female. The tube was placed usually over the splenic area or epigastrium, with the anode twelve to fourteen inches from the surface of the body. The exposures were from eight to ten minutes each, and from a Müller, Gundelach, or Swett and Lewis tube having a spark gap resistance of from three to four inches, and excited by a current of two to three milliamperes in the secondary, generated by a twenty-four-inch coil and electrolytic interrupter. The lower extremities were also separately exposed for three minutes at each sitting, with the tube in the neighborhood of the knees.

The patient was exceedingly anxious to leave the hospital and return to her home as soon as possible. Her skin seemed to be not at all susceptible to X-rays. Because of these two facts, and because the progress of the case was rapidly favorable, the treatment was pushed vigorously. A slight bronzing of the skin of the abdomen appeared after eight exposures, but there was nothing worse than this until after twenty-six had been made. Then the skin of the entire abdomen became very red suddenly, and a burn of the second degree developed within three days. Part of the area about the size of a hand became worse, and later showed the appearance of a third degree burn, while the surrounding skin healed.

This ulcerated area is just about healing now, five months later.

After the twenty-sixth treatment, the patient was well enough to leave the hospital, April 20. The leucocytosis had then decreased to 15,360, and the spleen extended to a short distance below the level of the umbilicus, and anteriorly to one and a half inches to the left of the median line. The following table shows the progressive reduction in the leucocytosis :

March 20	245,500
March 23 (metabolism experiments started)	272,000
March 24	249,000
March 25	276,000
March 26 (X-ray treatment started)	302,000
March 27	262,400
March 28	252,400
March 29	246,400
March 30	214,400
March 31	191,200
April 1	149,600
April 4	96,000
April 5	80,080
April 7	40,080
April 9	32,800
April 11	30,400
April 13	27,720
April 15	28,440
April 17	17,440
April 18	15,200
April 20	15,360
April 26	12,480
April 30	6,480
May 8	9,040

From April 20 until May 3 (two weeks) only five treatments were given, because of the dermatitis and the general improvement, and these applications were made to the left side and back. She returned to her home May 10, and the leucocytes then numbered 6,080 and the

spleen was still smaller. The blood count was as follows :

Hæmoglobin .....	85 per cent
Red cells .....	5,220,000
Leucocytes .....	6,080

After April 15 the urine was practically normal.

Realizing the experience of most men, and because our first patient died during an acute relapse, and because this second patient was being treated for a recurrence, she was advised to have an occasional X-ray application through the summer, and to have several close together in September — this present month — as both the primary attack and the recurrence had started about this time of the year. The last report received from her — about two months ago — stated that she was feeling very well, and had gained thirty pounds in weight, but that she still had the burn.\*

In addition to the reports of the facts of importance in the two cases, I wish to bring out in this paper the value of a careful study of the effects of X-ray exposures upon the process of metabolism, particularly in connection with the treatment of the disease under discussion, and to emphasize the necessity of exercising the utmost care in treating each case of this kind. Dr. Edsall made a careful study of the effects of the treatment upon the process of metabolism and tissue destruction in each of these cases, and he has kindly permitted me to add here an abstract of his investigations.

The experiments of Heineke have shown that the effect internally of prolonged X-ray exposure upon animals is

\* Since the writing of this paper, this patient has returned with a recurrence. She had no X-ray treatment while away. The spleen is slightly larger. The first leucocyte count was 90,000 and one week later (October 10th) it had increased to 250,000. X-ray treatment has been renewed, and the effect upon metabolism is being watched.

As this goes to press, the patient has symptomatically recovered from this attack after seven weeks of X-ray treatment.

manifest only in the lymphatic tissues of the body and in the bone marrow, with complete destruction of the lymphoid structures early, and before any very marked symptoms arise. The reduction in size of the spleen and lymph glands and disappearance of white blood-cells in cases of leukæmia under X-ray treatment are in accordance with the results of these experiments. It is to be supposed that the tissue destruction occurring in leukæmic cases under this form of treatment is limited to the lymphatic structures, and perhaps to the bone marrow in addition. Tissue destruction does take place undoubtedly, as experiments have shown, and with such great rapidity that the individual could certainly not show signs of improvement or recover were the other normal structures of the body affected much if any by the rays. The results of X-ray action upon leukæmic tissue are certainly not the same as those observed in the structures of the surface of the body in the X-ray burn, or in the epithelioma breaking down or healing under treatment.

There is a marked contrast in the effects of the applications upon the process of metabolism in these two cases, as is shown by Dr. Edsall's investigations. For a period prior to the beginning of X-ray treatment in the second case, and previous to active treatment of the relapse in the first, both were placed upon a carefully measured diet of milk, bread, butter, eggs, sugar, rice, steak, and baked potatoes. The amount of nitrogen and  $P_2O_5$  taken in at each meal had been estimated at as nearly accurate a figure as is possible, and we may assume that it was correct without going into the details. During the control period prior to X-ray treatment, and for three days following the beginning of ex-

posures, the nitrogen,  $P_2O_5$ , uric acid, and purin bases in the urine in each case, and the nitrogen and  $P_2O_5$  in the feces were estimated daily. It was not advisable to adhere to the rigid diet longer than these periods on account of the conditions of the patients.

In the first patient, who showed at the time the signs of a profound toxemia during an acute relapse, and who was rapidly becoming worse, there were no evidences of an excessive general tissue destruction after X-ray exposures, as shown by comparison of the results then obtained with those of the preliminary control period. The results were similar under the later regular diet. The tissue destruction was not excessive either before or after beginning treatment, and we may assume, therefore, that this severe and acute toxemia was not necessarily due to such a cause, as is often the case. As there were no evidences of nephritis we may assume that there was no interference with or incompetency of kidney function.

During the first three days of X-ray exposures, when the investigations were carefully made under restricted diet, it was found that the applications had practically no appreciable effect upon metabolism and tissue destruction, which were scarcely at all excessive. Therefore in a case in which X-ray treatment was having no effect, and which was rapidly growing worse, tissue destruction was not increased by the exposures, but as death approached, it seemed really to decrease.

In the second patient who was apparently "cured," the experimental results were in marked contrast to those in the first patient who died. There were in this case as in the first no evidences of abnormal tissue destruction revealed during the preliminary control period,

but on the other hand there was really a retention or loss of products. After the three days' control period, X-ray exposures were started, the patient remaining on the same restricted diet. There was at once a marked increase in the elimination of products indicating a similar increase in tissue destruction, and this was made manifest with remarkable rapidity. It will be noted that there was a corresponding decided decrease in the leucocytosis accompanying these changes. The increases in the average daily excretions in the urine compared with the period previous to treatment may be stated roughly as follows:

Nitrogen .....	70 per cent
Uric acid .....	60 "
Purin bases .....	260 "
Phosphates .....	200 "

The amount of nitrogen and phosphates in the fecal excretions was practically unchanged, or not altered sufficiently for consideration. Dr. Edsall concludes that the increase in tissue destruction during this period of three days was more than one hundred per cent. Accurate figures could not be determined subsequently, after resumption of ordinary diet, but there is every reason to believe that these percentages continued or were increased.

That the toxemia manifested in this patient was not due to tissue destruction may be considered proven by the fact that as the destruction was greatly increased the patient became better and the toxemia disappeared. In the first case it was not due to this cause as the destruction was not at any time excessive. Leukæmic tissue may be responsible for the toxemia, however, either by the elaboration of toxins, or by their production during the process of building up the excessive amount of tissue.

Surely there is no other therapeutic

agent capable of producing such rapid and marked destruction without injury to the rest of the economy, and moreover, there is none known that will cause such destruction with an improvement in symptoms at the same time. Tissue destruction is undoubtedly the greatest factor in the results accomplished by the X-ray treatment of leukæmia, whether it be the only factor we do not at present know. It is probable that the action is not direct, but that the X-rays exert their influence upon *autolysis*. The almost immediate effect and the rapidity of destruction would seem to favor this view.

The X-ray has the power of influencing tissue destruction in other conditions as well as in leukæmia, but not to the same extent. Dr. Edsall has noted an increase in metabolism in cases of gout exposed for Dr. Stengel and himself in our laboratories. With the idea that an unresolved pneumonia persists because of the absence of the necessary autolytic process required for the destruction of the exudate Edsall had X-ray applications made in one case of this kind for the purpose of stimulating autolysis, as in leukæmia. The efforts in this case met with apparent success.

Realizing the remarkable influence of X-ray exposure upon leukæmia, we must recognize the fact that we are employing not only a very valuable but also a most dangerous therapeutic agent. The very rapid and extensive destruction of lymphatic tissue that we bring about in treating this disease is sufficient evidence for the observance of great care in carrying out our treatment. We do not know that this same effect upon lymphoid tissue may not result in the normal individual or animal, or in one suffering from some other disease, and we do know that in experiments upon animals,

excessive destruction of these tissues and the bone marrow due to prolonged exposure may end in death. We cannot be absolutely sure that some unfortunate results may not at some time be experienced while applying ordinary treatment without reasonable care. There is sufficient reliable evidence at hand to allow us to place credence upon many of the reports of evil results following X-ray exposures, such as extreme prostration, febrile reactions, and other manifestations of an apparent intoxication, gastro-intestinal disturbances, and nephritis. Beyond any possibility of doubt, sterility may be induced by X-ray applications, and our patients, both male and female, should always be protected from any such unfortunate result.

In addition to our two examples of the same disease, one of whom was benefitted while the other was not, it is possible to mention other conditions, as Edsall has pointed out, in which X-ray treatment may improve one case and make another worse. The effect of X-ray exposures was tried in two cases of pernicious anaemia under his care in another hospital. Neither of them had responded to ordinary treatment. A single exposure on the first patient was followed by a violent chill, high fever, prostration, a rapid fall of red cells from 1,200,000 to 600,000, and death a few days later. A second patient who was rapidly growing worse, and had a red cell count of 700,000 quickly improved under X-ray applications, and later the count had increased to 3,500,000. He was treated in the same way for a relapse one year later, and there was some improvement for awhile, and in one week there was a gain of 2,000,000 red cells, but after a certain point was reached there was no further change. As there

were evidences of an intoxication in the first case and not in the second, it was concluded that this was the cause of the difference in results, and that possibly the additional tissue destruction due to a single X-ray exposure overwhelmed the first patient.\*

Not only should the toxic condition of a leukæmic patient be carefully studied, but also the tissue destruction should be investigated, before and after beginning X-ray treatment. These observations should be made in the case of other constitutional diseases as well. Both of these points should be watched and compared, in order to guard against dangerous effects, and to ascertain the results being accomplished. Each case of this kind should be reported in detail, irrespective of the ultimate result, in order that we may all arrive at the proper technique for treatment, and learn better the values and dangers of this therapeutic agent.

It was the intention to include in this paper the reports of one case of Hodgkin's disease and one of polycythaemia still under treatment, but space and time forbid more than a very few remarks in regard to them. In the case of pseudo-leukæmia, all the superficial lymphatic glands and the spleen were markedly enlarged. Under prolonged X-ray treatment the glands and spleen were very much reduced in size, but whenever the exposures are discontinued for any length of time there is always a tendency for a recurrence of the manifestations.

The case of polycythaemia was referred by Dr. Alfred Stengel and Dr. B. F. Stahl. The red cells numbered about

\* Since the writing of this paper, a patient with pernicious anaemia was referred to our laboratories for X-ray treatment. A preliminary control period of metabolism investigations had been made by Dr. Edsall. One X-ray exposure lasting four minutes was followed in a few hours by very alarming symptoms. The exposure was not repeated.

10,000,000 when treatment was started. While exposures are continued the count varies from 7,000,000 to 9,000,000, but there seems to be no tendency as yet toward a permanent reduction to normal.

### *Discussion.*

Dr. A. L. Gray (Richmond) narrated a case of subacute lymphatic leukæmia treated by him. He used a static machine with a spark gap of five inches, treating each aggregation of lymph glands about five minutes and the spleen about the same length of time. A blood count was made after the fourth treatment. The white cells numbered 45,000; red cells, 2,000,000; hæmoglobin,

between seventy and eighty per cent. At the end of the second week the white cells numbered 25,000; third week, 18,000; fourth week, 15,000; fifth week, 10,000. The treatment was then stopped, the patient having to leave, but when seen two weeks later all the glands had disappeared and the man felt perfectly well. Death ensued about one month afterward from pulmonary tuberculosis.

Dr. George E. Pfahler (Philadelphia) reported a case which is symptomatically well after two years' treatment.

Dr. W. S. Newcomet (Philadelphia) cited a case that presented enlarged lymph glands in the lung that had been mistaken for miliary tubercles.

## THE APPROXIMATION OF HUMAN VISION TO THE CONCEPTION OF ROENTGEN RAY PENETRATION—A NEW APPLICATION OF THE STEREOSCOPE

BY HENRY O. FEISS, M.D., OF CLEVELAND, OHIO

**A** Roentgen image represents a projection of distorted translucent and superimposed shadows.

It is a projection because it represents various points of a solid body placed according to a uniform standard upon a flat surface.

We use the term distortion to include perversion in the size and shape of the image, due to the fact that the rays which project the points radiate from one point or focus. In order to be undistorted the rays would have to be parallel.

We use the term translucent because one shadow is projected through another.

This very translucency brings about superimposition.

The intensity of the projected shadows depends upon the density of the structure in the path of the rays, that is upon the shadow value of the structure, if we may use such a term. This shadow value is theoretically dependent upon the degree of absorption power, that is, the more rays that are absorbed the greater its shadow value. Other things being equal the shape of the projection depends upon the location of the focus in a horizontal plane.

The size depends upon the distance of the focus from the object. But the size also varies according to the distance of the plate from a fixed position of the object. Increasing this distance does not change the shape but does increase the size. We speak of this as "main-

taining the relative distortion," and will come back to this subject later.

There is nothing in human vision which corresponds to the conception of actual Roentgen ray penetration. By this we mean that the human eye is not able to conceive Roentgen ray penetration of thickness. It merely sees the result, either upon a fluoroscopic screen or a developed negative plate.

Although the retina does not have penetrating vision a Roentgen image does suggest depth. It suggests this on account of the distortion due to conical radiation. Those parts of an object which are closest to the plate have the least distortion and their details are pictured most strongly and accurately, but the parts further distant from a plate are relatively much more distorted. It is, therefore, by experience in recognizing degrees of distortion with a knowledge of the condition in which the picture is taken that we get our suggestion of depth. If Roentgen rays were parallel, not even a negative plate would suggest depth. (At least we must suppose so, for we cannot try the experiment, as we cannot reflect Roentgen rays. The only theory which would lead to other conclusions is that Roentgen rays may lose their power on account of absorption in penetrating an object.) It is safe to assert, however, that the suggestion of depth in the ordinary Roentgen picture depends practically upon our knowledge of the distortion.

The nearest thing to a reconciliation of human vision to Roentgen ray penetration is that of conceiving the object as divided into infinitesimally thin slices and then to conceive that each slice is radiographed by itself and the images so obtained superimposed in their proper succession upon one another.

Now to leave for a moment the sub-

ject of Roentgen rays, let us turn to a photograph. A photograph cannot suggest penetration of opaque objects but can suggest solidity. It does this by means of surface shadows. The photographic image represents the result of light rays reflected from the surface upon the negative. The conception of solidity depends partly upon experience and partly upon double vision. For present purposes we may leave the element of experience out of our consideration.

As to double vision the retina of one eye conceives the image of an object from one point of view and the retina of the other catches it from a different angle. The two images blended in the brain suggest solidity. It is upon this principle that a stereoscope is made. By means of it we can change the flatness of an ordinary photograph into a seeming relief, so that the image stands out. We can see around the object, so to speak.

The method of obtaining the stereoscopic pictures, as is well known, is by using a camera with two lenses placed as far apart as the distance between the eyes. Then in looking at the pictures through the stereoscope each retina sees a different picture, one on one side and the other on the other, and this simulates human vision so closely that we once more see the solidity of the object.

Now a Roentgen picture does not treat of surface shadows. Hence, the use of a stereoscope in picturing penetration can have little sense if we make our picture by photographic methods. The suggestion of depth upon a Roentgen image is that due to distortion and must rest upon the theory that the rays come from one point. Now an image brought into the mind through a photographic stereoscope depends upon seeing the objects from two points of view. We said before that in a stereoscopic photo-

graph we apparently see around an object. In the Roentgen image there is nothing to see around. We must content ourselves with seeing through. If we get an impression from a Roentgen image that we are seeing about an object it is no longer a Roentgen image because it represents two points of view.

Now why is it that if Roentgen pictures are taken by the ordinary stereoscopic method, that is, by placing the tube in two positions like a stereoscopic camera, why is it that we can place these images in a stereoscope and get the impression of solidity?

The answer is very simple. Because we are taking the Roentgen images and trying to change them into photographs. We are using Roentgen shadows as surface shadows. We are, therefore, trying to change physical laws. Take, for example, the ordinary long bone. Radiograph it according to the stereoscope-photographic way, that is, from two points of view. In each picture we get a central medulla which has a light shadow value and the cortex in which the intensity of the shadow is much greater. We can take these pictures and use them as stereoscopic photographs. The retina no longer conceives these varying shadows as shadows in intensity, that is, in their proper Roentgen shadow value, but they appear to be surface shadows. That is, the external cortex is heavier and very nicely simulates the external surface shadow of the bone if the light were placed in a certain position. Therefore, by the false conception of these Roentgen shadows as surface shadows and looking at them in the stereoscope as such, we get an impression of solidity. But, of course, this is a fallacious impression. It is not the distorted, translucent, superimposed Roentgen penetration which we are trying to conceive.

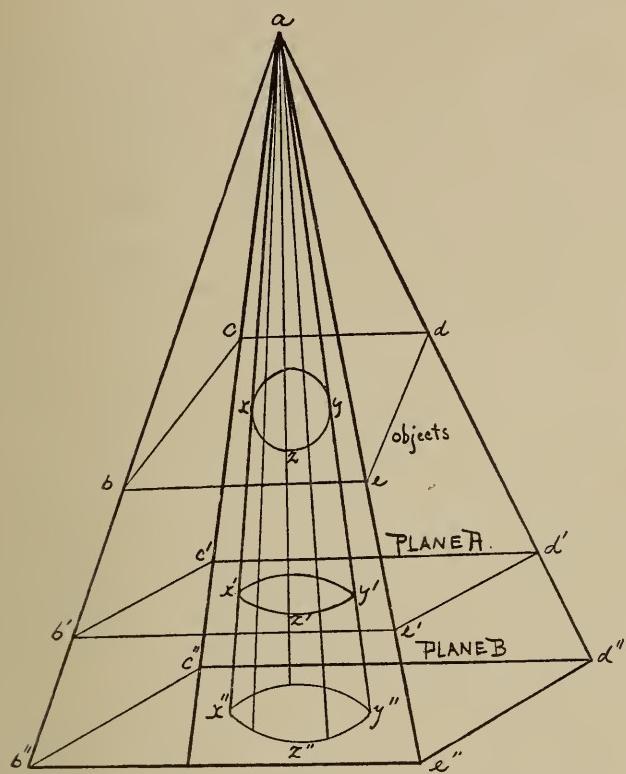
To prove that fallacious solidity is possible even in dealing with surface shadows, we simply cite the method of the government in detecting counterfeit notes. The official takes a good note, places it next to the suspected note and then looks at them through a stereoscope. If there is the slightest difference between the two he gets the impression that certain parts of the image stand out in relief. He simply gets a fallacious idea of solidity. Bearing this in mind it is easy to see how the apparent solidity of stereoscopic Roentgen pictures may be fallacious.

The question now is, is it possible to get an honest impression of penetration from a Roentgen picture? By honest, we mean an impression which corresponds to what the human eye could see if it were the focus of the anode of the tube.

In order to make such an impression honest we must, in the first place, get our conception from one point of view. We must, therefore, arrange a contrivance so that both eyes see from the same focus on the anode. This immediately suggests a stereoscope again, but a stereoscope which does not do what a photographic stereoscope does, because, as we said before, we are not dealing with photographs. We must try to get an instrument which gives us two images but one point of view, and this can only be done by maintaining the relative distortion for each eye. In other words, we may permit one eye to see further than the other. Therefore, when the two retinal images are conceived in the brain, the difference in distance will give us something analogous to a conception of a human eye seeing from the point of view of the focus of the anode.

To illustrate this point let us turn to the diagram. Let  $a$  represent a focus of

the anode, let  $b, c, d, e$ , and  $x, y, z$  represent two flat superimposed objects, one



quadrilateral and the other circular and of unequal density to Roentgen rays. Then a bundle of rays streaming from  $a$  upon the object will cast two shadows which, if conceived as blocked off in space, in their projecting sense, may be resolved into two parts, one pyramidal and the other conical, the latter being included in the former. If we intercept this shadow block anywhere except in a plane parallel to the objects upon a sensitive plate we get in plane  $A$ , indicated in the diagram, the figures  $b', c', d', e'$ , and  $x', y', z'$ . Both the size and the shape of these figures vary from the original. Thus we have hypothetically produced distortion (having used a distorting angle for the interception.)

If we again intercept the shadows lower down in the block in a plane parallel to plane  $A$ , as in plane  $B$ , we get the figures  $b', c', d', e'$ , and  $x', y', z'$ . In this plane the size and shape of the figures again vary from the original,

but differ from each other exactly as those in the upper plane  $A$ . That is, the relative degree of difference from the original is exactly the same in the two intercepting planes. This is what we mean when we use the expression "maintaining the relative distortion."

The element in the lower plane which has varied from the upper, is the absolute size of the figures. Therefore in maintaining the relative distortion it has only been necessary to change the size. So conversely we may compare the distance of two impressions from the anode by comparing their sizes. If they differ only in this respect, they represent two varying distances. In short, to vary the impression of distance we must change that element in the distortion due to change of distance. (Another element which changes with change of distance is blurring. This blurring however depends chiefly on the change in size, for it means that a given shadow is spread over a greater area. It is difficult to illustrate the variation of blurring by diagram. But it is readily understood, by glancing at two Roentgen images taken in superimposed and parallel planes, that it goes hand in hand with change of size, and, for the sake of simplicity, may be considered a necessary accompaniment of that change, when due to change of distance.)

According to this theory we proceed as follows in making our pictures. We lay the object upon a negative plate and at a distance of about one-eighth inch, immediately beneath that plate and parallel to it we place another plate so that one plate is superimposed upon the other (a piece of pasteboard or wood may be used to separate them.) The object is now exposed and both of the plates developed, when each will present a Roentgen image of the object, the lower

## EFFECTS OF THE ROENTGEN RAYS

plate, of course, having a picture exactly like the upper so far as relative distortion goes, *i. e.*, one of which is slightly increased in size and in which there is more blurring. Looking at these two in a stereoscope we get an impression of depth as though we were looking through the object.

It is bound to be so because one eye sees the image at one distance and the other at another distance, but in our mind we get a blended image. This blended image is neither the one image nor the other, but it is the two together. That is, we see a single image which represents two planes. If we see an image representing two planes at the same time we have to conceive the shadows as blocked off in space and so

get an approximation of the conception of penetrating vision.

But we may go further, at least in theory. We have only to conceive each picture to represent the superimposed shadows of different planes of the object. Each of these shadows has a corresponding one in the other image, but representing a different distance from the anode. Therefore the mind sees each plane at two varying distances and so gets the impression of penetrating vision for the whole thickness of the object.

Aside from the fact that the theory approximates a correct conception of Roentgen penetration, we have a method in which the technique is childishly simple, because we get both our pictures with one exposure.

### THE PATHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF THE ROENTGEN RAYS\*

BY J. RUDIS-JICINSKY, M.D., OF CEDAR RAPIDS, IOWA

**T**HE old saying, "Motion means life," may serve us in all our experiments and investigations regarding the electrochemical action and the effects of the Roentgen rays upon the living tissues and the blood. If we expose to these peculiar rays a photographic plate, the emulsion of the same will be altered chemically by the re-arrangement of the atomic structure of the molecules, or the Roentgen rays will produce a change in the absorbing material. The same process will follow the exposure of living tissues, where the radiant energy, in the form of light, will make certain changes

in metabolism, and in the vitality according to the produced stimulation or irritation, and will have also some effect upon the blood. If that is the case, we can understand why the bombardment of particles, or the division of an electrical spark in a vacuum tube, the motion of certain rays of light, demonstrate the evidence of a chemical action of the so-called chemical rays, which are found more abundantly in the Roentgen ray than in any other form of light, and then these rays affect even the cells, glands, nerves, and vessels in the deeper tissues with all the selective power for pathological tissue, which in their atomic

\*Read at the Sixth Annual Meeting of the American Roentgen Ray Society, at Baltimore, Md., September 28-30, 1905.

arrangements are more complex than the cells of normal tissue. And right here we have to remember that the wear and tear of the body, the action and the motion of the individual cells differ in every individual in the performance of the varied physiological functions, and the greater or smaller injuries to which it is frequently exposed, make indispensable for the maintenance of its integrity a more constant and wide-spread regeneration of tissue.

This regeneration of injured or worn-out tissues, all new growths, malignant or not, as well as the hyperplasias, are invariably brought about by proliferation or other changes in living cells and in their nutritive factor, the blood. This new formation of cells in the body persists through life with varying degrees of activity and the degrees of the effects, pathological or physiological, of the Roentgen rays upon them during an exposure will certainly differ with every individual tube, and with the characteristics of the person exposed. It is true that the cells of the adult organism are the offspring of one original cell, the ovum, but it is also a fact, that all the new cells which appear in the body under abnormal conditions are derived from some pre-existing cells by a division of their bodies, and that the blood itself has to suffer from the activity of some factor in addition to prolonged local irritation.

I have exposed the mesentery of three frogs simply to the air, and of three other frogs to the rays from a tube with a special prolongation, in such a way that the best rays were falling directly upon that portion of the tissue studied under the microscope. At first there seemed to be no apparent change, but then the arteries, veins, and capillaries dilated, and the blood flowed more

rapidly, but this condition did not last long. Stasis occurred in some of the vessels and leucocytes accumulated along the inner walls of the veins, and became fixed there in large numbers, and others were dragged slowly along by the current of blood, being in puriform shapes. The same condition prevailed in the capillaries. In about an hour after the exposure this emigration was increased, the cells passing between the endothelial cells and through the cement substance, which showed all the characteristics of inflammation, due certainly to prolonged local irritation, changed position and exposure to the air. Extravasation of the red-blood cells was slow, but the tissues around the vessels were somewhat swollen and serum poured out on the free surface with plenty of albumin, and mixed with cells showing an alteration in the composition of the blood plasma, with fibrin in abundance. These changes were first proliferative, leading to the formation of new cells, but later destruction and absorption followed with changes in the connective tissue and parenchymatous cells.

In the portion not rayed the whole process was much slower and not so marked, the polynuclear leucocytes going through the walls of the capillaries and veins but not of the arteries. The time required for the production of these results varied considerably in the two lots of frogs. In the frogs rayed we observed the phenomena within an hour after the exposure; in others it took many hours with variations observable among the individuals. This latter suggests the existence of constitutional idiosyncrasy towards prolonged local irritation, which may be hereditary and most probably is largely concerned in determining the onset of degeneration in

## EFFECTS OF THE ROENTGEN RAYS

a given case. Further, there may be a toxic chemical constituent developed in the blood by the action of the ray, especially in debilitated constitutions.

Knowing this, we can easily understand the action of the rays upon more highly organized tissue, the process of gradual destruction eventually removing by necrosis the diseased and poorly vitalized pathological tissues of malignant or other character. The action itself, as proved by me through different experiments on guinea-pigs and rabbits, and described before this honorable body at our first meeting in New York, is beyond doubt of an electrochemical nature. There is nothing in the pathological conditions present in the different malignant growths, and others which may ultimately become malignant, to discredit an opinion that some biochemical process may be the principal factor in their etiology. The various so-called intracellular and cellular inclusions which have been isolated and so fully described by Plirmer, Scheller, Cohnheim, Von Leyden, and others as parasites, and by Nosske and Greenhough as secretion deposits, are nothing more or less than transformed remains or deposits of the parent intracellular matrix, some of which has been included in the cells during the process of chemical reaction. And if so, any chemical measure that would tend to neutralize this action or restore proper function would of itself effect a cure.

I have exposed ten guinea-pigs and ten rabbits to intense irritation daily, at first for ten seconds, and later for ten minutes, with the tube at a distance of six inches or less. The guinea-pigs partly lost their hair after twenty exposures. After thirty-four exposures we had two cases of very bad necrobiosis, which was aggravated when a very low

tube was used, backing up a spark-gap of four inches and excited by a strong current.

From this time on we could study the direct anatomical changes in the exposed tissues, and found that the longer the low vacuum tube excited by a strong current was used, the lower became the resistance in the animals. The guinea-pigs especially seemed to suffer generally. The appetite of all the animals was good, but at the end of the experiment two guinea-pigs died. This was after the fiftieth and last exposure.

The bodies of these two were dissected. Degeneration was found in the entire posterior horns and tracts of gray matter. The spinal canal seemed to be dilated, due to hemorrhages. Both animals had very extensive so-called "burns," showing an active inflammatory process, with the development of fibrous tissue. The walls of the blood vessels, especially the intima, thickened, and the lumina contracted, a thin layer of necrotic tissue destroyed, also the nerves. In what order these tissues were attacked is hard to say. Strange as it may seem, injured parts — the thigh in one case was contused, and there the necrobiosis first started — are more susceptible, especially when there is something in the system which enfeebles the tissues and nerves, and prevents those injured parts resisting influences which the healthy parts can and do encounter without harm. I refer to my article, "The So-called X-ray Burn," *New York Medical Journal*, March 17, 1900. In my opinion the vasmotor fibres bear the brunt of the attack of excessive irritation, with a corresponding contrast of the symptoms in the tissue cells, as described above, and then we have, perhaps, a nerve affection, or an atrophic neurosis, with mortification proper. The

irritation, when sufficiently prolonged, attacks the peripheral extremities of sensory nerves, and causes a paralysis of the vaso-motors of the vascular area affected; the spasmodic contraction of the arterioles and capillaries follows, and the proper nutrition of the cells, if nothing more, is impaired. This seems to be the *primum mobile*. There might be relaxation but all the special inflammatory steps are manifested, not only at the focus of excessive irritation, but spread over a large contiguous surface, due to communication of the irritation to the vaso-motor center of the spinal cord, whence it is reflected over a wide vascular area.

If we examine the sections of tissues removed after prolonged raying, we may easily demonstrate the above-stated compound facts and observe microscopically the alterations produced on the mucosæ with corresponding areas whose nutrient vessels had undergone changes. These changes seem to begin first in the vascular walls, and not in the epithelium, being secondary and produced in an indirect manner, because the blood in the beginning of the attack by the rays proper is not changed. The red corpuscles have to yield to the white ones certainly, but they preserve their property of undergoing hemolysis under the influence of the serum, and the latter retains its hemolytic action. The spectroscopic property of the blood is not modified (Baerman and Linser.)

With these changes, which are directly dependent upon disturbances of the circulation, the death of tissues is caused by direct stasis in the blood-vessels, giving us proof that certain Roentgen rays are similar, in their actinic properties, to the rays of light, at the violet end of the spectrum, and that various tissues and cells react under radiation

differently, their resistance being regulated, so to say, according to the quality and the chemical composition of the plasma and the amount of liquid they contain. This explains the variations in the resistance exhibited by different human bodies to raying; different tissues present different resistances, and the resistance of the same tissue in the same person varies under different circumstances.

A few years ago some of us considered these rays to be a new sort of caustic, and thought that in order to obtain beneficial results so-called "burns" must be first obtained. This theory, through the results of my investigation as just described, and by the fact that cures often occur without any decided dermatitis or even "tanning" preceding, is rendered untenable, especially if we remember that the effects are not due entirely to the light, but to a peculiar electrical discharge occurring from our tube, which will affect photographic plates, produce fluorescence on the screen and which is markedly analgesic. There is electrochemical action present, and that seems to exert a favorable and powerful influence upon cells of all varieties, and has an effect upon some malignant growths adapted for this treatment, superficial or deep, as for instance in tuberculosis of the joints and glands, subcutaneous extravasation of blood, leukæmia, lupus and cutaneous carcinoma.

As regards the action of the rays upon the blood we have to remember that in malignant cases, an examination of the blood may show nothing abnormal in the beginning, but later on when the growth progresses a secondary anæmia, perhaps pernicious, may appear. In twelve cases of carcinoma and sarcoma the highest erythrocyte count was 6,110,-

## ROENTGENOGRAPHIC DON'TS

000 (in a case of carcinoma of the stomach), but the lowest was 2,150,000 (in a case of sarcoma of the femur). The haemoglobin in all cases was reduced correspondingly, and leucocytosis was present in all the cases. The differential count made in five cases averaged as follows:

Polymorphonuclear neutrophiles ninety-five per cent before the surgical and X-ray treatment combined, after the exposures and operations 65.5 per cent; lymphocytes 3 per cent before and 27.4 per cent after; transitionals 1.50 per cent before and 4 per cent after, eosinophiles 1.80 per cent before and 1.19 per cent after with some basophiles and myelocytes after the treatment, with fifty exposures as the basis in all cases.

These numbers seem to be very significant, the cases being all deeply located. With old superficial cases the count is not much different. In leukaemia, or better sarcomatosis of lymph and blood-producing organs, it seems that the rays alone very speedily reduce the number of lymphocytes and the size of the spleen in splenic cases. Not only are the white-blood corpuscles so notably reduced in number that they do not exceed, if they even equal the normal figure, but the red corpuscles are increased in number (M. Beclére), and all

the morbid manifestations are done away with. In twelve cases of leukaemia we had about 296,000 white corpuscles to begin with, and after twenty exposures of the patients to the Roentgen ray, raying the spleen in every case, we reduced the number to about 12,000 and later on to normal.

Usually after a few exposures of certain lesions, even where the integument was intact, we may find a more or less profuse exudate of a clear, transparent, lemon-yellow fluid of a specific gravity of about 1.060, and of distinctly alkaline reaction; and we and others found this exudate to crystallize readily upon exposure to the air, and that solutions injected under the skin of mice invariably produced death within forty-eight hours. It will irritate the healthy portion of the tissues around the lesion proper and act as a caustic; with the diminution in quantity of this exudate the healing process begins.

In inoperable deep malignant lesions which we have to ray just to relieve pain and suffering, if we do not secure proper drainage toxic effects will surely and soon be encountered with all the secondary conditions dependent thereupon. This is an important point to be borne in mind, and constitutes the closing thought which I desire to leave with you.

## ROENTGENOGRAPHIC DON'TS

BY PRESTON M. HICKEY, M. D., DETROIT, MICHIGAN

*Roentgenographer to the Children's Free Hospital of Detroit*

1. Don't suppose for one minute that a successful technic depends upon the use of any particular coil, tube, plate or developer. It depends on one's ability to practically apply one's knowledge

of the principles of the art of radiography.

2. Don't suppose that the patient will not move during the exposure. Immobilize the part so that movement

is *impossible*. Even slight movement will often blur diagnostic detail.

3. Don't attempt to make an exposure if the tube shows evidence of inverse discharge. Your plate will show the effect of inverse more than the tube.

4. Don't use a high vacuum valve tube.

5. Don't try, except in experimental work, to best the record on short exposures. Remember that most of the records for short exposures are made under the most favorable conditions and hence do not represent the average exposure.

6. Don't fail to have your developing trays *clean*.

7. Don't use an overdose of bromide of potash or acetone sulphite on an under exposed plate.

8. Don't be in a hurry to finish development: watch the back of the plate, or, better still, develop the number of minutes which you have found by experience to be sufficient for the developer which you are accustomed to use.

9. Don't forget to label the plate as soon as it is finished. Your memory may be at fault after a month has elapsed.

10. Don't fail to study your poor plates and find out why the result was bad. Profit by your failures.

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## EDITORIAL

IT will be observed that a different system of abstract classification is inaugurated in this current issue of THE ARCHIVES, which we believe will greatly facilitate access to whatever matter the individual reader may be seeking. Hitherto the special journals covering the field of physiological therapy have been abstracted seriatim and included, without regard to the character of the individual articles, under the one heading of "Current Physiological Therapy," while the abstracts of articles from the general journals have appeared under the heading "Miscellaneous Abstracts." Hereafter no special department will be reserved for the special journals, but the abstracts of both special and general journals will be classified and grouped, according to the subjects of which they treat, under appropriate headings, as "Electrotherapy," "Radiodiagnosis," "Radiotherapy," etc.

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The American Roentgen Ray Society will hold its next (Seventh) Annual Convention at Niagara, on August 28th, 29th and 30th, 1906. The programme and other particulars of the meeting will be published in THE ARCHIVES as soon as possible.

## ELECTROTHERAPY

**Reaction of Degeneration in the Levator Palpebrae (G. Huet-*Annales d'Electrobiologie et de Radiologie*, January 1906.)** The intrinsic eye-muscles are not excitable either in a normal or a paralytic condition. The levator palpebrae alone shows in the latter case a slow reaction to the galvanic current during the period of hyperexcitability. The writer reports several cases and gives the reasons which explain such an exception. This excitability appears after two or three weeks, increases for a time, and disappears when recovery is near. It may therefore have some importance from the standpoint of diagnosis and especially of prognosis.

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**Linear Electrolysis in the Treatment of Urethral Stricture (M. Gallois-*Annales d'Electrobiologie et de Radiologie*, January, 1906.)** The necessary appliances are a galvanic battery connected with a well-regulated rheostat and a very sensitive aperiodic galvanometer. The electrolysor consists of a long, fine bougie, one-half of which is flexible and acts as a conductor, while the other half is rigid and is formed by an insulated metallic wire. About in the middle of the instrument, at the point of junction of the metallic part and the bougie emerges a blunt platinum blade, having the shape of a half lozenge with rounded angles. In another type of instrument, the blade has the form of an entire lozenge. These blades are more or less wide. Nos. 20 to 23 are the most usual.

The instrument is introduced into the canal and the blade brought into contact with the stricture. This blade is connected with the negative pole, and a

large pad connected with the positive pole is placed on the abdomen above the pubis. When the blade touches the stricture the current is turned on (10 to 15 ma. In a time varying from ten seconds to two minutes, the stricture is passed. Then the general measures used in internal urethrotomy are taken.

The writer reports his cases, tabulates all other cases known and dwells upon the manifold advantages of that bloodless and simple operation, which has been subject to impassioned criticism.

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**Physiology of High Frequency and High Tension Currents (O. Libotte-*Annales d'Electrobiologie et de Radiologie*, January, 1906.)** High frequency currents give rise to four different kinds of phenomena: electrostatic, dynamic, induction, resonance. They may be applied either directly by autoconduction, by autocondensation, or locally by means of appliances that raise the tension (Oudin's resonator or d'Arsonval's secondary coil). Such applications are mono- or bi-polar. General applications are painless and do not cause muscular contractions. Direct applications have no influence on sensibility, simply give a sensation of warmth and induce perspiration.

High frequency currents exercise an energetic action on vaso-motor nerves. Blood vessels become dilated and arterial tension decreases. But, under certain circumstances, we can increase arterial tension by applying resonance sparks to the skin or in the vicinity of the vertebral column.

Pulmonary aeration and oxidation become more active. The exchanges between the tissues and the blood are in-

creased and consequently this modality is a regulator of the processes of nutrition. Its influence on thermic production has not yet been established conclusively but in connection with the urinary secretion, on the contrary, it has been well studied. The quantity of urine, urea, uric acid, total acidity, phosphates, sulphates and chlorides, increases. So does the urotoxic coefficient. High frequency currents exhibit no bactericidal properties, but may perhaps attenuate the virulence of some toxins.

The action of these currents is explained by a transmission of vibratory energy to the living cells; they give a new and strong impulse to all the functions of vegetative life.

**Electricity in Diseases of the Prostate and Neighboring Organs** (*E. Doumer-Annales d'Electrobiologie et de Radiologie*, January, 1906.) During the past nine years the writer has treated 120 cases of these affections by high frequency currents, produced either by a static machine, by d'Arsonval's small solenoid, or by Oudin's resonator. He prefers the latter, though all three apparatuses work just about as satisfactorily. He has used indifferently metallic or glass muffled electrodes; the latter seem to give more rapid and more complete results. The electrode is introduced through the anus and is pushed about 2 or 2.5 inches in. The treatments have lasted from 3 to 12 minutes: they are always longer with metallic than with glass muffled electrodes. A treatment must be given at least every other day, and preferably every day.

The classification of the cases was as follows:

Engorgement of the prostate,	42 cases
Chronic or subacute prostatitis,	63 "
Chronic periprostatitis,	10 "
Acute prostatitis,	5 "
Prostatitis complicated by vesiculitis,	2 "

122 cases

In four cases of acute prostatitis, the treatment was begun at the onset of the disease and results were very satisfactory. In another case, where treatment was delayed, there was no improvement.

In all but two of the chronic cases, the sedation of pain was remarkable after the first or the second application. The purulent secretion was also very rapidly modified. The cure is a permanent one.

**A Case of Pulmonary Tuberculosis cured by High Frequency Currents** (*A. Leun-Annales d'Electrobiologie et de Radiologie*, January, 1906.) A report of a very severe case treated by high frequency currents produced by a Rochefort's bipolar resonator fed by a 16-inch spark coil. A metallic screen connected with one of the solenoids was placed on the patient's back. The other solenoid was connected with the effluvator. The effluvia were directed towards the right apex for about 8 minutes, and later towards the gastric region for 2 or 3 minutes. After 5 treatments, improvement appeared but the temperature jumped to 104 deg. and 105 deg. F. Another course of treatments a month later was followed by the same improvement and the same rise in temperature. After each of those thermic ascensions, the general condition became better, the bacilli less numerous, till after six months a permanent cure was obtained.

### RADIODIAGNOSIS

**The Advantage of an X-Ray in Every Case of Dislocation or Fracture** (*Noble M. Eberhart—The Medical Standard, March, 1906.*) Eberhart feels that a roentgenograph should be taken of every case where fracture may be suspected, because of the frequent difficulty of diagnosing fracture and the deplorable results that sometimes follow failure to find one. If the fracture or dislocation has been properly reduced it is a source of comfort to the physician to know it and if it has not then the fact certainly should be known. He recommends making a plate instead of merely a roentgenoscopic examination, as "a plate may be admitted as legal evidence when testimony concerning fluoroscopic findings will not be allowed."

As illustrating the advisability of invariably employing roentgenization in these cases, he cites five cases, roentgenographs of which are shown.

The first was one of supposed sprain of the hand which was treated as such for three weeks. It was then roentgenographed and fracture of the proximal phalanges of the second and third fingers was found. Union, however, had already taken place with shortening.

The second case was one of fracture of the elbow in which a concomitant fracture of the epicondyle was overlooked.

The third was a case of fracture of the elbow which had been treated by extension until union had taken place, when it was found that the arm could be extended backward 15 to 20 degrees farther than it should, but it could only be flexed comparatively little. Roentgenograph was made at this time and showed an intra-articular fracture of the lower end of the humerus and a fracture

of the upper portion of the olecranon with some separation of the fragments and a large callus.

Case four was an old fracture of the neck of the left femur "at the junction of the base of the neck with the shaft of the femur, simulating a dorsal dislocation in every particular, viz.: the shortening; inward rotation of foot and knee; and, finally, the loss of the usual relation of Nelaton's line." It was impossible to differentiate between a fracture of the neck and a dorsal dislocation of the femur with the structural changes incident to so old a case. The roentgenograph showed "that the base of the femoral neck had been fractured at its junction with the shaft. A neglected, or lack of proper extension of the limb, had allowed the femur to recede upwards and union had taken place between the base of the neck and the shaft at a point about one and one-half to two inches below its normal position, thus simulating the dorsal dislocation." If the roentgenograph had been taken at the time this accident was sustained much of the shortening and deformity might have been avoided.

The fifth case was one of forward dislocation of the astragalus which had not been discovered until the roentgenograph was taken. This step was suggested by the patient's inability to bear his weight upon his foot after it was supposed to have gotten well.

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**The Roentgen or X-Ray in the Diagnosis of Tuberculosis of the Lungs** (*William H. Dieffenbach, The New England Medical Gazette, March, 1906.*) Dieffenbach recommends that the tube used for fluoroscopic examination of the thorax should be one of high vacuum

and that the nearest surface of the glass of the tube should be eight inches from the skin of the patient. The tube should be arranged by means of a ratchet so that it will be raised or lowered as the roentgenoscopic screen is raised or lowered during examination. By this means the relative direction of the rays, namely at right angles to the cathode stream, is constantly maintained and the best penetration is secured.

He prefers a coil to a static machine for making roentgenographs, as it can be done very much quicker, from one to thirty seconds with a coil as contrasted with from three to eight minutes with a large static apparatus. In important cases he recommends taking two plates, one posteriorly and one anteriorly.

He regards limited excursion of the diaphragm (Williams' sign) as one of the most important and probably the earliest indication of involvement of the lungs. The excursion of the diaphragm can be best studied by placing the screen on the back of the patient on a level with the sixth or eighth dorsal space. In normal, healthy respiration, the diaphragm moves from one-half to three-quarters of an inch on either side; in forced respiration the right side of the diaphragm moves two and three-quarters inches, the left two and one-half inches. He considers roentgenization more valuable for making the diagnosis of early tuberculosis than almost any other procedure because results can usually be attained by it earlier than by any other measure. He speaks of the differential diagnosis of various lung conditions as follows:

#### *Emphysema*

"The excursion of the diaphragm is limited especially in the upper area, the normal rise of the dome of the diaph-

ragm being absent. We find, in addition, usually the characteristic barrel-shaped thorax, the ribs being in a horizontal position during forced inspiration. The heart is usually in a vertical position due to the lowering of the diaphragm and increased pressure of the lungs. Portions of the lung present a whitish, absolutely transparent appearance of the parts affected, surrounded by an area of less transparency or even slight opacity."

#### *Pneumonia*

"An accurate diagnosis of a central lesion can be made—the area showing a dark shadow of distinct consolidation. This lesion, central pneumonia, has heretofore been diagnosed usually by exclusion. The history of the case, with the rapid appearance of dark or hazy interspaces between the ribs will not make differentiation difficult. The diaphragm is, of course, limited to its excursion on the affected side—if the lesion is bi-lateral total immobility of the diaphragm will be present."

#### *Pleurisy with Effusion*

"The outline of the opaque shadow of the fluid is well defined, the opposite side showing normal transparency. In this disease restriction of breathing, instead of hyperactivity of the well side as noted in pneumonia, is a feature."

#### *Miliary Tuberculosis*

"The lung presents a characteristic disseminated mottled appearance, which, when once seen, can be instantly recognized.

"In conclusion it can be stated that in the Roentgen ray method of examination we have a means for the early detection of tuberculosis with its invaluable importance for early treatment; are able to watch the progress of the disease and render valuable prognostic ser-

vise through the frequently changing but reliable picture presented on examination."

**Legal Conditions of the Use of the Roentgen Ray (Dr. Chauffard, *Journal de Physiotherapie*, February 15, 1906.)** This article is the report to the Paris Academy of Medicine of a committee appointed to study the question of the use of the X-rays by physicians and by laymen and to make a report with a view to securing new legislation in the matter. The committee members were Mm. Brouardel, Debove, Gariel, Gueniot, Hauriot, Motet, Berier, Pouchet and Chauffard.

After reviewing the history of the applications of X-rays to medical sciences during the past ten years, after recognizing the important part played by non-medical men, the report exposes the very serious danger those rays present when unskillfully handled, and show that the important parts of X-ray science are the indications and the interpretation of the results obtained. These can be intrusted to physicians only. The more recently discovered action of X-rays on the genital glands is one more reason for not allowing persons who do not give the necessary moral and professional guarantees to use an agent which may so easily be diverted to unlawful purposes. The question of professional secrecy is also to be considered.

The conclusions of the report, namely, that the use of X-rays be restricted to physicians only, were adopted, after a lively discussion, by a unanimous vote of the Academy.

**An Electrostatic Radiometer for Measuring the Quantity in Radiotherapy (E. Albert-Weil, *Journal de Physiotherapie*, February 15, 1906.)** The methods at

present used in radiotherapy all give the final quantity of rays given after a certain time.

$$Q = I \times T$$

Quantity equals Intensity times Time  $Q$  may remain the same with very different values of  $I$  and of  $T$ , provided the variations of  $T$  and  $I$  be inversely proportional to each other. Therefore, the measurement of the final quantity is no absolute safeguard, because the same quantity may correspond to a weak and prolonged, or to a short and strong, exposition and the action on the organism is not at all the same in both cases. The knowledge of  $I$  is therefore necessary; it cannot be given by the present calorimetric methods. Francois has just devised the following appliance: in front of the tube, on the localizer are placed two parallel metallic sheets, of known size, and separated by a known distance. Those sheets act as the armatures of a condenser, the air being the dielectric. They are called equalizers of potential or simply equalizers.

The localizer must allow not only of a lateral, but also an anterior, regulation. Belot's localizer fills all the conditions required.

The inventor has used, as a constant difference of potential, a 100 Clark-elements battery giving 138 volts. This seems to be the best. This battery is connected on one side with one of the electrodes of the equalizer and on the other with a very high resistance, the other extremity of which is connected with the second electrode of the equalizer. A multicellular electrometer is placed in shunt on the two extremities of the resistance.

When the equalizer is exposed to X-rays, the difference of potential between its two electrodes tends to disap-

pear under the influence of the discharge provoked by said rays. (The intervening air becomes ionized and a more or less perfect conductor of electricity.—

Ed.) Consequently, a current, very weak, naturally, will circulate through the resistance. The two extremities of the latter will therefore have a difference of potential which will be proportional to the intensity of the current, and the value of this difference will be given by the electrometer.

If the discharge of the equalizer is zero, the electrometer will indicate 0; on the contrary, if it is rapid (a few milliamperes under the circumstances), the index of the electrometer will indicate almost 100 volts.

The discharge produced by X-rays gives an average reading on the electrometer; its value for equalizers of constant power depends on the resistance and electromotive power employed.

Mr. Francois is now studying the substitution of a chemical resistance in order to make the appliance more sensitive. The electrometer may be graduated in ohm's or milliamperes because, according to Ohm's law, the difference of potential between the extremities of the resistance is given by the formula:

$$V = RI$$

R and the battery being constant, V is directly proportional to I.

The use of correction tables (hygrometry, ozonometry, etc.) does not seem necessary, because what we want to find is not an absolute, but a relative value for a given application. It would be perhaps good to determine special units which would make the interpretation of the reading easier. Such a unit (C. G. S. system) would correspond, for instance, to the intensity of the current generated by the discharge provoked by

X-rays in a known equalizer placed at a known distance from the anticathode, the electromotive force being E volts and the resistance R megohms.

The discharge of the equalizer represents an effective work, and cannot be strictly indicated by a unit of the I order, but rather of the W order.

The other constituent element of the W dimension would be, by electrometric analogy, comparable to E, the index of tension. This element is what is called in radiology, penetration of rays, and is measured accurately enough with Benoist's radiochromometer.

The simultaneous use of the radiometer and the radiochromometer allows us, therefore, to evaluate the energy proper (W) of X-rays, and to deduct their quantity and their penetration, by simple comparison of both apparatus.

This electrostatic radiometer substitutes precise measurements for the empirical ones employed thus far.

(A similar apparatus for determining the intensity of the X-ray by measuring the rate of electric discharge through air ionized by the X-ray was published a year or two ago by Dr. Milton Franklin of New York. The reliability of such a method of dosimetry is influenced by two considerations. (1) The X-ray is far from being the only ionizing radiation from the X-ray tube. (2) Is there any evidence that the intensity of the X-ray always bears the same proportional relation to the total ionizing radiation as measured by the apparatus under consideration?—Ed.)

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Methods of Experimental Study of the Transformation of X-Rays and of the Secondary Rays Resulting (G. Sagnac, *Le Radium*, January, 1906.) In order to determine whether the

secondary rays were due to selective diffusion or to transformation of the Roentgen rays, Sagnac made use of the following facts: In selective diffusion no difference between the diffused light and a portion of the incident light can be observed and hence it is immaterial whether the rays be subjected to passage through a substance before or after diffusion; if on the other hand, the order of the passage has an influence on the intensity or the character of the light then the dispersion is due not to diffusion but to transformation of the rays.

In applying this method to the secondary rays from the Roentgen rays, the intensity was measured qualitatively by photographic or electrical means. In the general case it was found better to separate the secondary rays from the Roentgen rays (as shown in Fig. I) rather than to examine them in connection with the Roentgen rays (Fig. II.)

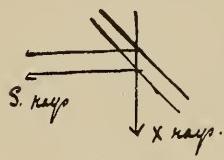


Figure 1

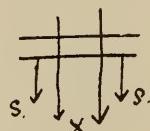


Figure 2

The S-Rays are easily absorbed by air and after passing through a few mm. of air the intensity falls to such a low value as to render difficult accurate results. In order to eliminate this difficulty the two plates (one of which we might properly call the analyser, the other of which is the source of the S-Rays) were laid upon the sensitive side of a photographic plate.

The most trustworthy results, however, were obtained by working in a Crookes vacuum. In the particular case mentioned, the source of the secondary rays was a platinum plate inclined 45 deg. to the path of the incident Roentgen rays; the S-Rays passed through

three small openings which limited the size of the cylinder of rays and fell upon a photographic plate 11 cm. from the platinum plate. The impression on the plate was that of the openings. The third opening was then partially covered with a quartz prism, and later with a prism of fluorspar. The area of the affected portion of the sensitive plate was decreased showing that quartz and fluorspar are opaque to the secondary rays. The effect of graphite was not sufficiently evident to admit of any definite statement.

The author shows that the secondary activity of aluminum is due in very large measure to the presence of alloys (such as lead and iron.)

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**Contribution to the Study of Secondary Rays** (*Dr. Courtade, Bulletin Officiel de la Societe Francaise, February, 1906.*) The writer has studied the action of secondary rays on photographic plates. He has experimented with lead, copper, tin, and aluminum. The experimental disposition was the following:

(a) A plate of ordinary glass placed on a table.

(b) On said plate were placed samples of different metals in the shape of plates equally thick (about 2 millimeters.)

(c) Above photographic plate, the gelatin being directly in contact with the metallic plates so that the rays had to go through the glass of the sensitized plate before they reached the gelatino-bromide layer.

Metals emitting secondary rays determine on the plate a supplementary imprint. The sensitized surface is subjected to a greater reduction and there is a reinforcement of the image.

With an exposure causing only a weak

impression, and with No. 6 rays, Courtaude has found that:

Aluminum does not emit secondary rays powerful enough to produce a reinforcement. Copper determines a weak impression, lead a stronger one, but tin is the most active.

In order to study the penetration, the writer covered one-half of the metallic plates with a double sheet of the black paper used to wrap up packages of needles. Copper and tin gave imprints

under those circumstances, lead did not. Tin must be chosen for reinforcing screens, especially tin foil which becomes intimately adherent to the photographic plate. This adherence is very important, because if there is any distance between the plate and the metal, the impression is much weaker. This method is best used with films or with plates having another support than a glass support, because the latter stops many of the active rays.

## RADIOTHERAPY

**Report of a Few Cases Treated by the X-Ray** (*J. N. Scott, Journal of the Kansas Medical Society, March, 1906.*) This article is a report of six cases which were treated by roentgenization; five of them were cured and one (Case 6) abandoned treatment before he was entirely cured.

The first case occurred in a man 74 years old and consisted of a malignant ulceration in the cheek one inch long, one-half inch wide, and one-half inch deep with indurations surrounding the lesion. The growth had been treated for four years, and removed by caustics shortly before he consulted Dr. Scott.

He was roentgenized for a period of ten weeks, treatment being given at first every day, then every second day, then every third day and, finally, every sixth day. After the sixth day the discharge became less, and disappeared altogether at the end of the first month. The cavity commenced to fill in about the 20th day and the lesion had disappeared at the end of the ten weeks.

Second case occurred in a woman 64 years old and was an epithelioma of the nose, five-eighths of an inch in diameter and projecting one-quarter of an inch

above the skin, and was somewhat painful. She was roentgenized for three months, the treatments being intense enough to produce a little redness of the healthy tissue and finally scaling of the skin. At the end of the first month the growth had become harder and smaller and the main part of it dropped off. This was examined microscopically and the malignant cells found to be entirely destroyed and degenerated. At the end of the three months the lesion had entirely disappeared.

Third case was an epithelioma of the upper eyelid of some two years' duration, it having destroyed a part of the eyelid and being on the increase as regarded its size. She was treated for two months with entire disappearance of the growth and restoration of a large portion of that part of the eyelid that had been destroyed by the growth.

Fourth case was an epithelioma of the cheek one-half inch in diameter, in a man 61 years old which had existed for about a year. Three months' roentgenization at intervals resulted in entire cure.

Fifth case was a recurrent carcinoma of the breast occurring in a woman 53 years old; the operation had been per-

formed three months before, the entire breast and part of the axillary glands having been removed. Four glands were enlarged, two of them about three-quarters inch long and one-half inch in diameter. Site of the operation, axilla and neck, were roentgenized at intervals for four months. At the end of three months the glands were entirely absorbed and during the last month roentgenization was applied in order to be sure that the cure was complete. When the patient presented herself for treatment she could raise her arm but half way to the shoulder; after a few weeks' treatment she could easily raise it over her head and comb her hair.

Sixth case was an epithelioma extending from the inner canthus of the eye to the ear, in a man 62 years old, of three years' duration. The circumference of the ulcer was indurated and raised. The case was roentgenized at intervals for four months by which time it had healed with the exception of a spot about one-half inch in diameter. The patient became convinced that this place would heal without further treatment, returned to his home, and Dr. Scott has not been able to learn what the condition has been since then.

No details as regards technique are given.

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**Splenic Leukemia (H. J. Thompson, Medical Record, March 3, 1906.)** This article is the report of a case of splenic leukemia which was treated by roentgenization. The patient, a young woman thirty years of age, school teacher by occupation, first came under the observation of the author in August, 1904. She had noticed a tender tumor, somewhat painful, in her left side a year previously after having sustained a fall

upon her back which resulted in temporary paralysis of her lower limbs. She was dizzy and nauseated whenever she stood upon her feet, her bowels were constipated and she suffered from continuous soreness and pain in the left side. She had not menstruated for three months previous to her consultation with Dr. Thompson, but previous to this the function had always been normal.

Physical examination showed that the spleen extended "down to the crest of the ilium, filling the whole left abdominal cavity, also extending over to the right side of the median line (upper); it is tender on pressure. The liver is only slightly enlarged."

Blood examination showed red corpuscles 3,250,000, white corpuscles 650,000, haemoglobin 60 per cent.; no differential count was made. She was having an afternoon elevation of temperature of about 2 deg. F., with slight difficulty in breathing. She was unable to walk and was losing flesh, her weight being about 113 pounds when she came under treatment, waist measurement 34 inches.

From December 10th to February 10th she was roentgenized on an average of once every five days, the treatments being given with a moderately hard tube and continued for 15 minutes over the splenic region, the tube from four to six inches distant. On February 10th she weighed 116 pounds and her waist measurement had decreased to 30 inches. On December 11th she menstruated for the first time since the preceding July, the flow being good and fairly normal in color and of six days duration. The stomach symptoms, appetite, and bowel function had greatly improved. She was also given 1-30 grain of nitrate of strychnia three times

a day before meals. This latter drug was given to stimulate the circulation as the pulse was of low tension, irregular, and increased in frequency. Respiration had also greatly improved.

During the following two months treatment was suspended but she continued to improve in every way and had two normal menstrual periods during this time. She also developed the ability to walk from two to four blocks without assistance.

During the next four months she was roentgenized three times a week the technique employed being that already described. She was then able to take walks two miles in length, her weight had increased to 132 pounds, waist measurement had diminished to 27 inches, there was no stomach disturbance whatever, the bowels acted well, she was sleeping well and her appetite was good. Two last menstruations during this period were perfectly regular and painless. During these last two months, however, her legs swelled at times.

Three months later the improvement had continued; she weighed 137 pounds, and the waist line was so reduced that she could wear a waist and skirt with a belt, instead of a loose gown. Blood examination showed red corpuscles 4,160,000, white bloom corpuscles 120,000, of which there were polymorphonuclears, 61.5; large mononuclears, 11.5; small mononuclears, 20; eosinophiles, 1; myelocytes, 6; nucleated red cells to 100 red cells, 1; characteristics of cells, some irregularity of red cells; haemoglobin 75 per cent.

Examination of the eyes showed that the vessels were abnormally tortuous and that the veins were twice as large as the arteries instead of the normal proportion of 3 to 2. "In the region be-

tween the macula and nerve head were numerous yellowish white spots which the examiner was satisfied were made of leucocytes with a few red cells. These whitish exudates were not in any case surrounded by red margins as is almost invariably reported. There were no such conditions in the left eye. The nerve head in each eye was somewhat hazy due to exudates."

Examination of the ears resulted as follows: "R. Whisper, 6 inches; watch, 0; forks, c-c2; Renne+. L. Whisper, 15 feet; watch 40-40; forks, all; Renne +."

Thompson considers that the ear conditions are "due to exudates, either in the cochlea or in the cochlear nuclear in the medulla oblongata. A number of cases of leukemia are reported in which ear disturbances occurred simultaneously with eye troubles."

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**A Case of Leucocythaemia Treated by the X-Rays (W. B. Ransom, *British Medical Journal*, March 17, 1906.)** The patient was a woman aged thirty-five who had been ill for three years and had been treated by arsenic. Under this therapeusis her red blood corpuscles had increased during two months, from 2,700,000 to 2,848,000, and her white corpuscles had decreased from 252,000 to 48,800.

She did not get along well afterward and was readmitted to the hospital on November 7th, 1905. She was then given arsenic three times a day and roentgenized in addition. On November 19th her red corpuscles were 3,200,000, white corpuscles 160,000, haemoglobin 45 per cent. On February 1st following her red corpuscles were 5,600,000, white corpuscles 6,520, haemoglobin 75 per cent.

On December 14th differential count

of the white corpuscles gave 38 per cent. polymorphonuclear leucocytes, 42 per cent. myelocytes of various kinds, other forms 20 per cent. On January 26th, 1906, the differential count gave the following:

Polymorphonuclears . . . . .	53.6 per ct.
Myelocytes . . . . .	17.8 "
Large hyalines . . . . .	15.6 "
Lymphocytes . . . . .	6.6 "
Mast cells . . . . .	4.4 "
Eosinophiles . . . . .	2.0 "
Nucleated red corpuscles . . .	14.0 "

The patient grew steadily stronger, increased in weight, and the splenic enlargement diminished to a considerable extent.

The rays were applied almost daily for ten minutes over the spleen for the first month, but thereafter they were also applied over the bones of the limbs and sternum for ten minutes more each day. She had in all about fifty applications. "A soft tube was used at a distance of 10 inches with a primary (secondary? Ed.) current of 3 milliamperes." There was no trace of dermatitis but pigmentation of the abdomen was marked.

Ransom summarizes as follows:

"There has been much more improvement under X-Rays and arsenic than under arsenic alone. The patient has gained strength and flesh, her dyspnoea and languor have been much reduced, and the blood corpuscles in point of numbers have returned to normal. Indeed, there is a slight polycythaemia of red corpuscles. Some abnormal elements—myelocytes and a few nucleated red corpuscles—however, still remain."

(25, 1906.) The patient was a woman 36 years old. There was nothing in the family history that had any bearing on the case. She first noticed a swelling in the left side of the neck on May 30, 1905, which, by June 3, had reached its maximum. It was accompanied by dull pain. For several months previously she had been restless and nervous, had twitchings of the muscles of the lower extremities, and a peculiar sense of oppression in the chest. About a month before the goitre appeared she had a peculiar attack lasting for an hour during which she was unable to see. Distinct exophthalmos was noticeable.

Roentgenization was commenced July 26th, 1905, at which time the left lobe of the thyroid was about five centimeters in length and four in width, was firm, and seemed to be composed of ordinary glandular tissue. The pulse was 120 per minute. The heart showed no organic lesion. The patient was restless and had a haggard, careworn appearance.

She was treated three times a week for ten minutes, with a tube backing up a two and one-half-inch spark, one ma. of current traversing the tube. After one month there was distinct improvement both in the general condition and as regarded the size of the gland. This improvement continued until October 12, 1905, at which time she appeared to be perfectly well and treatment was discontinued. She was seen one month later and stated that she had never felt better in her life. Her pulse was 72 per minute, she had gained twenty-five pounds in weight, all nervous symptoms had disappeared and the gland was apparently normal. She was roentgenized twenty-two times and no erythema of the skin was ever visible. This was

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Exophthalmic Goitre Treated by the Roentgen Rays (G. E. Pfahler and M. C. Thrush, *The Therapeutic Gazette*, March

probably due to the use of the Roentgen ray filter described by Pfahler in THE ARCHIVES for November, 1905.

While she was being roentgenized she was also given "compound wine of iodine, increased from 10 to 30 minimis, before meals, and a pill consisting of extract of valerian, extract of sumbul, and powdered asafetida, of each one grain, after meals. After four weeks she was placed upon nitroglycerin grain 1-1000, and tincture of strophanthus 2 minimis, tincture of digitalis 1 minim, tincture of belladonna one-quarter minim. This was followed by a course of iron and arsenic. The patient went about her ordinary household duties and came to Philadelphia for treatment.

"We recognize the fact that other factors may have entered into the cure of this case; but on account of the improvement beginning four weeks after the beginning of X-Ray treatment, which is the usual time to note improvement as a result of the X-Ray exposure, because the improvement was progressive, and because other cases of both simple and exophthalmic goitre have been benefited by the X-Ray, we believe the result was due chiefly to the effects of the X-Ray. Six cases of simple goitre now under treatment (Pfahler) are improving, and will be reported later."

Pfahler has on record thirty-one cases of goitre which have been roentgenized, of which twenty-eight have showed improvement; four of the thirty-one were of the exophthalmic type. Whether or not the improvement has been permanent, however, has not been stated. He considers that we are justified in recognizing roentgenization as one of the proper and effective methods of treating goitre and that if the results prove to be

permanent it will probably be the best method.

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**The Treatment of Hypertrophy of the Prostate by the Roentgen Ray (C. Luraschi and C. Carabelli, *Annales d'Electrobiologie et de Radiologie*, January, 1906.)** The writers have used the following technique: After protecting the adjacent part with lead sheets, the tube was placed at a distance of 8 or 10 inches and irradiation was given through the perineum. The rectal speculum used by Moschkowitz the writers think useless. They report two favorable cases and believe the treatment of prostatic hypertrophy should be highly electric.

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**Additional Observations on the Use of Roentgen Rays in Dermatology (Henry W. Stelwagon, *The Journal of Cutaneous Diseases*, March, 1906.)** This paper is a judicial review of the conclusions formulated and read by Dr. Stelwagon before the American Dermatological Association in 1903.

As to apparatus Stelwagon still believes that there is very little choice between the static machine and the coil except that the static machine is a much less dangerous apparatus. Owing to the influence of atmospheric variations upon it, however, he uses the coil more frequently. While good curative effects can be obtained in cutaneous diseases from a 6-inch coil he prefers one of 12 inches; the latter apparatus is also superior for the generation of high frequency currents.

The vacuum of the tube used for cutaneous work should rarely exceed that which forces back a 3-inch spark and one producing between one and two inches of spark is probably better yet. He questions the advisability of maintaining the same vacuum throughout an

exposure, believing that if the exposure is begun with the vacuum producing a one or two-inch spark and then allowed to rise, as it will under the influence of the current, the disease in its varying depths can be better influenced.

While some cases are amenable to curative influence without the production of dermatitis, yet he believes that in the majority of cases improvement will not present until some erythema has been produced. Such erythema rarely produces permanent evil effects, but sometimes atrophic changes in the skin will be brought about by it. It is a very delicate if not an impossible matter to gauge, and occasionally second grade burns ensue. In some cases the atrophy did not develop until several months after the last exposure. Atrophic changes, such as thinning and reddening of the skin, scaliness and keratotic changes indicating possible epitheliomatous development, also sometimes occur as a result of apparently slight erythema.

Stelwagon locates his tube (anode?) 10 inches from the lesion and exposes for three minutes; in epithelioma he sometimes exposes for five minutes. In the milder dermatoses exposure should rarely exceed 10 minutes and the distance be rarely less than 6 to 8 inches and such intensity of treatment should only be applied with caution. In more malignant dermatoses, however, the final duration of exposures and distance limits can be much more boldly approached, the tube in obstinate cases almost touching the surface and the time-duration of the exposure reaching 15 or 20 minutes, or even longer.

In changing from one tube to another duration should be lessened and distance lengthened for the first two or three exposures as different tubes ex-

hibit different degrees of action intensity under apparently the same conditions. Roentgen ray meters now on the market cannot be depended upon as accurate indicators of Roentgen ray intensity.

It is best not to limit the exposure strictly to the area affected, but also to expose a fair margin of the apparently healthy tissue surrounding the lesion. The operator, however, should be thoroughly protected by boxing the tube or by the interposition of a metal screen between himself and the tube. Ray-proof gloves should also be worn when the tube is manipulated just after the Roentgen ray production has been stopped, as a Roentgen-ray glow remains in the tube for some time after the current has ceased to pass.

While the value of roentgenization in epithelioma can no longer be denied, yet he does not consider it a specific for this trouble and believes that the best method of treating such lesions is to curette or excise and then roentgenize from 5 to 10 times afterward. In this way more rapid results may be secured than by roentgenization alone.

In lupus vulgaris its action is sometimes brilliant, but is almost always slow; in some cases it is only moderately effective and in other cases no effect at all is produced. Occasionally satisfactory results with lupus erythematosus are seen, but it is much less effective in this trouble than in lupus vulgaris.

In acne markedly favorable results are obtainable, but it has not a uniform curative value in all cases and in some produces little or no effect. Relapses also occur, but are not so frequent as with other methods. Its use in this disease is probably best reserved for the obstinate and extensive cases. The danger of atrophic changes in the skin

should be borne in mind in connection with roentgenization in this disease.

In psoriasis it should be reserved for obstinate cases presenting large affected areas and this same remark holds true as regards its use in eczema. It should have no place in the treatment of eczema which can be managed usually by other means, being reserved for those cases exhibiting obstinate thickened areas and rebellious localizations. In keratosis of the palms and in localized hyperhidrosis roentgenization produces fairly good results. In sycosis it also exhibits curative influence. In hypertrichosis the risks are so great as to discount the possible good obtainable. In ringworm of the scalp it is a most valuable method.

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The Therapeutic Use of X-Rays in Dermatology (*Oscar E. Bloch, American Journal of Dermatology, March, 1906.*) Bloch, of Louisville, Kentucky, reports the following cases which he has cured by roentgenization but as he gives practically no details as to his technique the article is valuable only as a contribution to the clinical literature of the subject.

The first case was a pink naevus the size of a penny on the forehead over the inner angle of the left eye. The whole time of treatment extended over a year and resulted in complete recovery.

The second was tuberculosis of the cartilage of the fifth rib on the left side in a man thirty-seven years old, which had been operated upon three times; a sinus was present. The lesion was roentgenized 36 times during eight months with perfect cure as a result.

The third case was of post-cervical lymphadenitis. Three of the glands were broken down and these were

opened, scraped, and drained. The lesion was roentgenized eighteen times with entire disappearance of the enlarged glands as well as of those that had been drained, as a result.

The fourth was a case of eczema of both elbows and the scrotum which had existed for several years, resistant to all treatments. He was roentgenized twenty-nine times in the course of a year and three months, with entire cure and no recurrence as a result.

The fifth was a case of sycosis as large as a twenty-five-cent piece, on the right sub-maxillary region, which had resisted treatment for a long time. Was roentgenized eleven times with perfect recovery as a result.

The sixth was an ulcer on the tip of the nose as large as a penny which had been gradually increasing for two years. The lesion was roentgenized eight times during a period of three weeks when the lesion disappeared.

The seventh was an epithelioma the size of a white bean on the lower eyelid. Thirteen applications of the ray extending over a period of two months resulted in entire disappearance.

Bloch has rarely been obliged to cause a dermatitis in order to secure satisfactory results and recommends an ointment composed of Balsam Peru and enough zinc oxide to thicken it to a proper degree of consistency as an excellent application for X-Ray burns. He protects healthy parts with tin foil having the exposed area a little larger than the diseased one. He uses a soft tube for applications to the skin and a harder one for treating the glands and joints. He places his tube as close to the exposed part as possible without giving the patient an electric shock, and uses a coil to excite it.

**The Roentgen Ray Treatment of Lupus (Ennion G. Williams, American Journal of Dermatology, March, 1906.)** The two most important therapeutic qualities of the ray are its influence upon the vitality of the cells of the tissues and its bactericidal power. The former is more cumulative than the latter and numerous short, weak exposures will never produce the destructive effect of a single, strong, intense one, although the total amount of energy expended may be the same. To obtain a bactericidal effect, therefore, individual exposures must be sufficiently intense and long to destroy the bacteria. Williams finds that thin layers of substances of slight density, even four layers of surgical gauze, will filter out those rays which have a bactericidal effect, a fact of very great importance in treating bactericidal diseases. In order to destroy the bacteria he has found it necessary to apply, in a few exposures, enough intensity to destroy the overlying tissues, in other words, to ray the part to the point of producing a slight ulcerative dermatitis. In lupus, therefore, the radiations from a low vacuum tube, rich in chemical rays, is preferable and the tube should be placed close to the part to be rayed.

The duration of the exposure must be determined by each individual operator as the Roentgen apparatus varies so greatly in its efficiency. It is necessary for the operator to know the "burning point" of his apparatus with the tube at different distances. "The factors in measuring and recording the radiant energy are the number of minutes, the distance of the anode from the surface, the reading of the milliammeter and the length of the equivalent spark gap in the secondary circuit. The operator should not trust to guess work, based upon the

instinct which is supposed to be developed by experience, when he can, by the factors mentioned, measure the radiant energy with almost mathematical accuracy. By these means one can regulate the exposure to produce a desired result and not give either too little or too much. If the exposure is too little, there may be an increased activity of the condition. If there is an over-exposure, there is delayed healing, pain and great scarring. If just the proper amount of radiation be given, an active inflammatory process develops one or two weeks thereafter, which, in less than a week, disappears, leaving the lesion healed or greatly improved. This procedure is repeated until the lesion entirely heals. After all visible evidence disappears, it is well to give one more series of exposures to insure the destruction of the remaining parasites and so prevent a recurrence."

Williams locates the anode of his tube from six to eight inches from the surface to be treated and gives in four daily exposures enough radiation to produce an active inflammatory process, i. e., just beyond the "burning point." Nothing is interposed between the tube and the surface and no fluorescent substances are given internally. The most he does, even when inflammatory conditions have developed, is to dust the part with boric acid powder as he believes that Roentgen inflammations disappear most readily if not interfered with by any artificial agents.

He reports three cases of lupus vulgaris and four of lupus erythematosus which he has treated by roentgenization, all of which recovered except one, and that one was nearly healed when the patient abandoned treatment. In one case a papule recurred after two years, but

this responded to exposures to radium bromide of 300,000 activity.

**Three Cases of Skin Tuberculosis, Presenting Unusual Features, Healed by X-Ray Therapy** (*Frank B. Wynn, American Journal of Dermatology, March, 1906.*) The first case was one of cutaneous tuberculosis in a man of fifty. Early in 1905 there developed in the skin of the right cheek a hard, flattened nodule; there was no tenderness, change in color, or tendency toward suppuration. The growth was suspected to be malignant and excised. It recurred in two months and was excised again, a large elliptical area two inches in length being removed.

Two months later the patient came under Wynn's observation, several pea-sized nodules having developed along the line of union and a tumor the size of a hazel-nut half an inch from it. The microscope demonstrated the growth to be tubercular in character and curettage followed. Twenty-five roentgenizations resulted in complete cure. There has been no recurrence after two years and a half.

The second case was one of lupus exfoliativus. The disease had completely obliterated the nostrils, from scar contractions. Patient was a woman 32 years of age whose family was markedly tuberculous. The disease had existed nineteen years.

This patient was roentgenized one hundred times but the period of time during which these treatments were given is not stated. Complete healing occurred, but the oral orifice contracted to the size of a lead pencil which condition was relieved by a plastic operation, and free respiration and reasonably good masticatory ability were thus se-

cured. There has been no recurrence after a year.

The third case was one of lupus vulgaris, complicated by epithelioma, and occurred in a woman thirty-nine years old. An older sister had died of phthisis when the patient was eleven years old, about the time the skin trouble first appeared. Process involved the lower region of the neck and the upper portion of the back on the right side and affected an area about as large as the palm of one's hand, which was raw, a purplish red in color, and bathed in pus; in the center of this was an area about the size of a silver dollar which was elevated above the level of the rest of the lesion.

The lesion was curetted and microscopical examination demonstrated cutaneous epithelioma, a very rare complication of lupus. Twenty-five roentgenizations effected complete healing both of the epithelioma and the lupus and left a small atrophic scar with some pigmentation at the periphery. The value of the article is greatly impaired by reason of the absence of details as regards the technique employed.

**The Use of the Roentgen Ray in the Treatment of Acne Vulgaris** (*H. Rockwell Varney, American Journal of Dermatology, March, 1906.*) Varney considers that we do not give due weight to the evil effect upon the self-respect, mentality, and life of the victims of acne, of the loathsomeness with which the disease is invested in the minds of an unthinking and sometimes unjust public. Many lives which might otherwise be useful and prosperous are seriously impaired thereby.

He considers that the Roentgen ray is, on the whole, the most satisfactory of all known treatments for acne and that

the most obstinate cases can be cured in a few weeks with no damage to the skin, if the treatments are cautiously and properly given, and that no treatment produces so perfect and permanent restoration of the normal skin structure, both in appearance and function, as that affected by roentgenization; this is even true of those patients whose general health is far below normal. The ray acts as a diffuse cell stimulant; in order to produce absorption of indurated, inflamed tissues a stimulation of such tissues is necessary and it is this stimulative action of the ray upon the acne nodule that produces degeneration and rapid absorption of the diseased cells by the surrounding normal cells.

He considers that the important technical points are:

"First, to tell the patient the kind of treatment to be applied, because of the aversion of some people to the X-Ray; second, to tell the patient that the diseased condition may appear to be worse before there is any improvement, for the first effect of the stimulation is usually to develop a new crop of acne lesion, as the glands that are becoming infected will become more quickly involved after stimulation has begun, but they will disappear as rapidly; third, tell the patient that there will probably be a slight tanning by the ray, and that later the skin of the face may itch or chafe slightly. It is at this stage, as a rule, when the stimulation should be gradually diminished, and the diseased condition will rapidly disappear."

He protects the healthy tissue with lead foil and exposes for three minutes at each seance, using a soft tube at about six inches from the lesion, and roentgenizes every twenty-four hours. He increases the period of exposure by half

a minute each day until slight erythema develops. This event indicates the maximum therapeutic dose and exposures are thereafter given only every other day with diminution of their duration. Roentgenization should not be abruptly stopped when the disease begins to subside but discontinued gradually, exposures being given three times a week, then twice, then once a week, then once in two weeks. At this time the patient should be instructed regarding the bathing and massage of the face so as to assist in the restoration to normal. A cure is usually effected in from three to eight weeks.

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**The X-Ray Treatment of Ringworm**  
(*Walter C. Oram, British Medical Journal, March 3, 1906.*) Under the above caption is published a letter from Dr. Oram in which he refers to the article upon this subject by Mr. Sichel in the British Medical Journal of February 3rd, as being of interest to X-ray workers, but he does not think that Mr. Sichel's percentage of cures gives a fair idea of the actual value of the treatment. He says:

"I feel sure that all will agree with him that the great crux lies in the estimation of the dose, and I believe that we receive but little assistance from either Sabouraud or Holzknecht's radiometer; I feel convinced that each worker must determine by a series of careful experiments with gradually increasing durations of exposure what dose is necessary for satisfactory epilation with his particular instrument, and, having found this, must keep the conditions constant. This entails much trouble and time both to the operator and to the patient, but is safer than trusting blindly to any form of radiometer. Personally, in the treat-

ment of ringworm by the method of single exposure, I have not been able, so far, to obtain in all cases that complete and uniform epilation of the whole scalp which alone makes the cure certain in extensive cases. Such an epilation can be obtained by a series of five or six exposures repeated at intervals of three or four days, the tube being placed at nine inches from the scalp. This is the method which I have used most extensively in the treatment of ringworm, though I have now discarded it in favor of Sabouraud's method of single exposure on account of the time which is thus saved. My results, so far, with Sabouraud's methods are not so satisfactory as those I obtained previously, as small patches and isolated hairs are often left behind, which if not originally infected become so when the rest of the hair falls out, and the disease is not cured. It may be that the action of the rays intermittently applied for some weeks produces a more complete suspension of function in the hair papillae, and it would be interesting to learn if others have noticed the same thing. In reviewing the results of Dr. Stopford Taylor's cases of ringworm which I have treated for him during the past year I find that, out of 108 children with this disease who have attended, 47 have been discharged cured, 11 have proved failures, and 15 are still under treatment. Of the remainder I can give no information; some only attended once or twice, others attended long enough to produce epilation, but not long enough for one to be sure that the disease was cured. The average time from the first application of the rays until the head was found to be free from broken hairs or scales was 2.7 months. To this must be added three months to

allow the hair to grow, and this makes the time of cure in the cases I quote about the same as Mr. Sichel gives. I have never seen anything approaching a permanent alopecia in these cases. The hair has always shown vigorous growth three months after the suspension of the rays, and, though the treatment is not without its dangers, I think that to admit 1 per cent. of accidents is to overestimate them."

#### Ringworm of the Scalp and Beard

(*James M. King, American Journal of Dermatology, March, 1906.*)

King refers to roentgenization in the treatment of ring-worm as follows: "The patches and about a half-inch beyond the border should be exposed one time to the X-Rays sufficiently strong to cause all the hairs and stumps to fall out. The strength of the rays and the length of time should be about as follows: The penetration should be 3 or 4 degrees, Benoist's scale, the scalp six inches from the anti-cathode and the total quantity of X-Rays should be 4H. or 5H., Holzknecht pastile. In other terms, the dose may be expressed as follows: X-Rays from a medium tube, the spark-gap four inches, the scalp six inches from the anti-cathode, and time fifteen minutes. On an average, one exposure given in this way is sufficient to produce alopecia. The X-rays cause an atrophy of the papilla of the hair, an interference with nourishment and a loss of the hair. The hairs begin to fall out about two weeks after the exposure, and is complete at the end of three weeks. If the hairs are not out by that time, the area should again be exposed. All remaining hair stumps should be removed with forceps."

After this the scalp is treated with

parasiticides, etc. This method cures the disease in from three to five months whereas four or five times that are required under the old methods. In ring-worm of the beard depilation is also best secured by roentgenization.

**A Danger from Roentgen Ray Applications** (*E. Doumer, Annales d' Electrobiologie et de Radiologie, January, 1906.*) Professor Doumer calls attention to a possible idiosyncrasy to X-rays and reports a case in which very small doses were constantly followed by radiodermatitis. He believes fractional doses at short intervals are much better than massive doses two or three weeks apart and that the greatest caution should invariably be exercised.

**The Deleterious Influence of Light upon the Skin** (*S. H. Brown, American Medicine, March 24, 1906.*) This is a review of the question discussed by Dr. J. N. Hyde, of Chicago (*American Journal of the Medical Sciences, January, 1906*), as to whether the actinic rays of light unfavorably influence the skins of certain sensitive individuals at definite ages of the body, in the direction of the epitheliomatous metamorphosis. The discussion of this question was brought up by a discourse on the etiology of xeroderma pigmentosum and cancerous changes in the integument.

It is well known that certain pigmentary affections tend steadily but slowly to degenerate into epithelioma. Indeed these have been termed precancerous conditions and include xeroderma pigmentosum, keratosis senilis, Paget's disease, and others, and the study of these diseases has thrown considerable light upon early cancerous changes in the integument. Xeroderma pigmentosum usu-

ally develops in early life and is "characterized primarily by freckle-like spots, especially on exposed surfaces, followed by telangiectases, atrophic changes, an giomatous and verrucous lesions, with increased pigmentary deposits, and finally, generally after some years, by epitheliomatous growths and fatal ending." Unna and other investigators in this field point to the indisputable fact that this chain of morbid phenomena has its genesis in the weakened resistance of the skin of the young child to the more refrangible rays of the solar spectrum. "The hyperemia and pigmentation being 'simply different endeavors to paralyze the injurious influences of light.' The surface of hyperemia acts like the red light of the photographer in the way of exclusion of the ultra-violet and blue rays which are the effective agents in the production of the mischief." Absolute immunity might, therefore, be obtained by a generalized melanosis. According to Unna, the melanotic granules permeate the papillary layer and cutis, forming a black net directly communicating with the pigmented lymph spaces of the prickle layer.

The action of light upon the skin is that of a stimulant and the stimulation is effective according as the individual integument is susceptible. The chemical rays produce upon a sensitive skin (1) hyperemia, (2) pigmentation, (3) atrophy, (4) cancerosis; the early changes are protective, acting as a screen against the actinic rays. It is also a well-known fact among radiotherapeutists that those who burn in sunlight are particularly apt to be burned by the Roentgen rays and that those who tan in sunlight react in the same way under roentgenization. It is, therefore, true that the beneficent effect of radiant energy ceases when the

effect extends beyond the production of cell atrophy.

As favoring this supposition may be mentioned the following statistical facts gathered from the census reports of the United States for the year 1900:

First, the death rate from cancer of the head, face and neck, or those portions of the body exposed to the sun, was 3.7 higher in males than in females.

Second, the farmer furnishes nine-tenths of the cancer mortality of this class.

Third, it is not exposure to inclement weather or extremes or heat or cold that are responsible for cutaneous cancer but rather continued exposure to direct sunlight, as Russian peasants, Eskimos, Egyptians, stokers, firemen, etc., are sel-

dom affected with the disease.

Fourth, in the northern regions the disease was more common in the white than in the colored population, indicating that a pigmented skin furnishes a certain degree of immunity against the actinic rays. "The law seems to be that this immunity is proportioned to the diffuseness and uniformity of the staining, and the danger point is reached in what is fortunately a minority of all skins, when the epitheliums are stimulated to furnish this immunity in a much less diffuse and uniform measure."

Brown considers that the subject is one which will probably lead to interesting investigations along this line, and that something profitable may be gleaned from it in the future.

### DIETOTHERAPY

**Buttermilk as an Infant Food**  
(*Walter R. Ramsey, St. Paul Medical Journal, March, 1906.*) Buttermilk has been used as a food for infants, in Holland for at least a century. In 1895 De Jager wrote of its advantages, and since then it has been investigated by many pediatricians. In September 1902 Baginskey stated that many had feared to use what was looked upon as a waste-produce in milk economics, a product which was neither fresh, nor had the least resemblance to the natural infant food; furthermore that there was the withdrawal of that most nutritious portion of the milk—the fat.

The buttermilk, which he had used in the Emperor and Empress Friederick Hospital in Berlin, was made from pure cream soured by bacteria, which produce a lactic acid fermentation. The butter is then removed by churning, and the buttermilk thus obtained is treated as follows:

To one litre of buttermilk 15-25 grams of wheat flour, and 35-50 grams cane sugar are added; with constant stirrings it is allowed to boil 2-3 minutes. The milk is then poured into bottles stopped with sterile cotton, and placed on ice until ready for use, when the milk is raised to the body temperature.

This prepared milk is far different from the ideal infant food. Woman's milk contains 3.5 per cent. of fat, 1.02 per cent. of albumin, and 7 per cent. of sugar; cows milk, 3.4 per cent. of fat, 3 per cent. of albumin and 4.5 per cent. of sugar; and prepared buttermilk, .35 per cent. of fat, 3.4 per cent. of albumin and 4.5 per cent. of sugar. The butter milk, it will be observed, contains a relatively small percentage of fat, and a relatively large percentage of albumin.

The casein is already coagulated, and divided into very small particles by the starch.

The acidity is due to lactic acid, which is not injurious to infants.

The improvement in infants by the use of buttermilk is shown first, in the stools, which become pasty and lose their odor; second, by gain in weight; and third, in the general appearance, for they become good-natured, smiling and friendly.

Baginsky reported three hundred cases fed with buttermilk. The results were successful, except in eighteen cases, which had serious complications. In no case, even when observed for a long time, did disturbances of nutrition, such as rachitis or scorbatus, develop.

Ramsey himself gives the histories of thirty cases, with successful results in uncomplicated cases.

He has sometimes found vomiting and diarrhoea quickly ceasing, and the child gaining rapidly in weight. It is necessary, especially in acute cases and very young infants to dilute the buttermilk, occasionally giving only one-third buttermilk at first, and gradually increasing the percentage as the conditions permitted.

In a few cases, especially where there had been a severe colitis, marked constipation followed the use of buttermilk. This was usually not persistent, but soon gave place to stools of normal consistency. In the meantime the constipation was overcome by a daily enema, or a dose of castor oil. When constipation persisted, the substitution of brown sugar or malted milk for the cane sugar was sometimes useful.

As the stomach becomes more tolerant, cream may be advantageously added to the feeding.

Two patients took the buttermilk for seven months without any apparent detriment.

In very young infants, or where the stools are very frequent, it is advantageous to brown the flour, by putting it in the oven and stirring it until it becomes a deep brown color. The starch granules are changed, and become more digestible, and the starch still acts as a diluent, breaking up the casein into small particles.

Fresh buttermilk must be secured, otherwise it becomes a poisonous product. In Berlin there is now prepared a powder by evaporating the water from fresh butter milk then adding the proper amount of starch and sugar, so that it may be kept indefinitely, and prepared for use by simply adding water.

The buttermilk obtained from creameries where the cream is soured to a specific degree, and churned daily, is wholesome, if immediately treated in the way already described. If, afterwards, it is placed on ice it may be kept for two days.

If fresh buttermilk cannot be obtained fresh cream may be churned at home.

Buttermilk is not only a useful food for sick babies, but is also excellent for well children of all ages.

In cases of acute entero-colitis, where there is a very rapid loss of tissue fluids, it is an ideal infant food, causing cessation of the vomiting and diarrhoea, and replacing the water in the tissues. The large percentage of sugar and albumin supplies an ample amount of food, which is readily assimilated. When the stools are foul, this condition suddenly disappears when buttermilk is used as a food.

## HYDROTHERAPY

**Gastric Lavage** (*W. Brownley Foster, Virginia Medical Semi-Monthly, March 9, 1906.*) The use of the stomach tube in conjunction with test meals furnishes diagnostic information of great value which cannot be obtained in any other way, and the therapeutic use of the tube is of very great value in the management of gastroenteric disease. The only apparatus necessary is a common, soft rubber stomach tube with a funnel, a pitcher for the solution, and a waste basin.

"The easiest tube to introduce is a fairly stiff one, with no terminal opening, but with a closed, conical end. Such tubes are not as easily cleaned as those with the terminal opening, since food residues lodge in the tube beyond the eyelets and are not readily dislodged. A very flexible tube is less liable to injure the stomach than a stiff one and is to be used where injury by the tube is feared. The eyelets should be well rounded, as their edges, if sharp, are prolific sources of injury to the mucous membrane. With a very soft and flexible tube, more difficulty may be experienced in passing from the pharynx to the oesophagus and in passing the cardia. The occasional coiling of a soft tube in the mouth and stomach is productive of much discomfort to the patient and annoyance to the operator. A large tube is desirable for the early removal of a mixed meal, and in any case in which tough mucus or large food masses, like unchewed meat, solid fruits, etc., are likely to be encountered. When the food masses are very large, the end of the tube should be wide open, though a very large terminal opening making it impossible to give the tube a conical end, makes its introduction more difficult and increases the liability to in-

jury of the stomach wall thinned by ulcer or softened by other disease. A tube of very large size produces more discomfort than a small one, and for this reason the large tube cannot always be used satisfactorily in untrained patients.

"For general use the tube should be of medium size and fairly stiff, should have a terminal opening and two large, oval, lateral openings about three inches apart. The tube should be fitted with a window of glass tubing, twenty-nine or thirty inches from the end. This will prove of great assistance in observing the flow of the contents. A bulb near the middle of the tube will afford useful means of freeing the tube of large food masses which may obstruct the flow, and will be of aid in starting the flow without compelling the patient to make disagreeable straining efforts to expel the stomach contents. The bulb is also of use in securing thorough mixing of the washing fluid with the contents. For this purpose, the tube should be pinched tightly beyond the bulb and the bulb sharply compressed and released a sufficient number of times to secure thorough mixing of the contents with the washing fluid. This causes a jet of water to impinge on the stomach wall with more or less force, cleansing it of mucous and other adherent matter, and produces more or less active churning of the contents, enabling us to cleanse the stomach more thoroughly and quickly and with a smaller amount of washing fluid. This process seems also to add to the tonic effect of lavage.

"For the so-called stomach douching, we should employ a tube with several small (1 to 2 mm.) openings and one larger hole of 3 to 4 mm, or else use

Turck's sprinkling tube. This is a double tube. The inflow tube is shorter than the outflow tube, and has its end perforated with numerous small openings which serve to divide the stream into as many smaller jets. The outflow tube has large openings and keeps the stomach comparatively empty so that considerable water pressure may be used with the instrument. It is an efficient and useful appliance."

The only lubricant necessary is water in which the tube is dipped and it is not often necessary to cocaine the pharynx although it is sometimes helpful in cases wherein it is important to avoid retching. It is best to have the patient sitting when the tube is introduced, the operator standing behind or to the right with his left arm about the patient's head. This gives him considerable control of the patient's movements should he resist the passage of the tube. No guide for the tube, such as a finger in the patient's mouth is necessary. Simply introduce the tube, instruct the patient to swallow a few times and gently slide it down. Resistance is sometimes encountered at the esophago-pharyngeal junction and sometimes at the cardia, but this yields in a few moments provided no deformity is present.

After the tube is inserted pour in through the funnel from a few ounces to a pint of irrigating solution and mix the fluid with the stomach contents by repeatedly raising or lowering the funnel, allowing the fluid to flow in and out. When it is desired to remove the fluid simply depress the funnel and the contents will begin to flow. Straining efforts by the patient will start it if it does not start itself. If the tube gets plugged squeeze the bulb after pinching the tube

beyond it or introduce a little more water. Be careful to withdraw all the fluid before introducing more and not to overdistend the stomach.

The therapeutic employment of gastric lavage produces three chief actions: (1) mechanical and chemical cleansing and antiseptis; (2) securing rest for the organ; (3) tonic effects.

Mechanical cleansing rids the stomach of indigestible or decomposing food, excessive mucous, and cultures of micro-organisms, and in cases of auto-toxaemia or acute gastritis from indigestible or tainted food lavage actually removes the prime cause of the disease. In some cases such conditions are the chief agents in prolonging the trouble and causing a long train of distressing symptoms. The mechanical effect of the fluid impinging upon the stomach wall is stimulating to the viscus and the alternate distension and emptying of the organ as the water is admitted and withdrawn is akin to massage and exercise.

Absolute rest is secured for the stomach from the time lavage is performed until the ingestion of the next meal and the securing of this condition is most important in acute gastritis, motor insufficiency, pyloric stenosis, etc.

Antiseptic drugs, among the most useful of which are salicylic acid, boric acid, thymol, hydrogen peroxide and menthol, can also be profitably used in solution, care being taken, of course, not to have the solution strong enough to intoxicate. Silver nitrate solution, about one part per thousand, is of great value in hyperchlorhydria. Irrigations with this substance often markedly decrease the acidity and soothe the mucous membrane. This solution injures rubber goods and

necessitates cleansing the tubes immediately after use.

Tonic effects may be secured by the use of sprinkling tubes, by varying the temperature of the solutions used, and by the employment of certain medicaments. The maximum of thermal stimulation is produced by the alternate use of temperatures of 115 deg. F. and 45 deg. F., respectively. Care should be used in the employment of very cold or very hot solutions. The excited heart action which may result from the use of hot solutions in the stomach will usually yield to a cold precordial compress.

In atonic conditions such as motor insufficiency, hypochlorhydria and hypo-secretion, irrigations with nux vomica and other bitters have given highly gratifying results. Probably the best technique for this procedure would be to give a simple cleansing lavage with warm, normal, saline solution first and then, with some sprinkling tube, introduce a pint of water containing one fluid dram of nux vomica and allowing it to remain a few minutes; then wash out this solution with an abundance of a solution of tincture of cinchona, one dram to the pint.

Probably the best time to perform lavage is from half an hour to an hour before the evening meal; the next choice being at bed time, and the last choice before breakfast. Although washing out of the stomach at bed-time insures the organ an all-night rest, yet Foster prefers to have it done about an hour before the evening meal because at this time gastric digestion of the dinner has run its normal course and if the meal be allowed to remain longer in the stomach stagnation and fermentation ensue. Performing the operation at this time allows

the replacement of the old material by fresh and healthful food, and rest of the stomach during the night may be secured by administering a supper of such a character that the crippled organ can easily dispense of it in a few hours. Foster believes that lavage should be resorted to in every case where the stomach is unable to dispose of a reasonably full meal in seven hours at the most.

The contra-indications to the use of the stomach tube are such local conditions as active gastric ulcer, gastric haemorrhage, local peritonitis or other local inflammations. Among the general contra-indications are severe valvular heart disease, fatty degeneration of the heart and arteriosclerosis. Fatal accidents from the use of the tube are, happily, very rare indeed, and are usually results of violent retching such, for example, as rupture of the stomach or rupture of aneurysms, etc., from high blood pressure incident to the strain of severe retching. Cases in which such accidents are likely, may usually be recognized at a glance, and calamitous accidents from the intelligent practice of lavage are rare indeed.

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The Nauheim Baths Treatment of Heart Diseases (*G. Wachenfeld, Jour. A. M. A.*, March 10, 1906.) This author desires to correct some wrong impressions made by the article of Professor Anders, published in the Journal of the American Medical Association for January 14th, 1905, in reference to the prevalent methods of treatment of cardiac disease at Nauheim. The Schott treatment, he says, is only practiced by Professor Schott, and gymnastic methods are used only to a limited extent or are disused altogether by the other practitioners of the resort. They rely

mainly on the baths, *prescribe all the rest possible*, and try with the aid of other means, such as massage, diet, etc., to unburden the heart.

To attribute recoveries at Nauheim to the exercises, he says, is absurd; it is the baths that are the essential curative factor. He considers gymnastics perilous in most cases of heart disease, especially in myocarditis. It is not with a poorly developed or weak muscle that we have to do, but with a diseased one that can never be strengthened by increasing its burden. Of the more than 26,000 patients treated at Nauheim last season the majority did not take the Schott gymnastic treatment, which has been given an importance to which it has absolutely no claim.

The special value of the Nauheim baths is in their stimulating influence on the lymphatic circulation, due to the salts contained, the presence of carbonic acid gas and other, as yet undetermined, agents of a physico-chemical nature, the proper conditions of temperature and further advantage of a great variety of forms of bathing, enabling the physician to grade the baths to suit the weakest as well as the most resistant patient. He says: "If at Nauheim it is proper to aid the baths by dietetic treatment and measures directed toward unburdening the heart—these include the Abee heart-support—certainly all these must apply

on a larger scale to treatment at home, where the artificial substitute must naturally fall behind the efficiency of the original Nauheim baths. At any rate, over-exertion of the diseased heart, gymnastic exercises in whatever form, cannot be too strongly condemned."

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**Ice Bags: When to Use Them (P. H. Aurness, *Jour. A.M.A.*, March 4, 1906.)** Aurness considers that ice bags are particularly useful in acute inflammations due to bacterial invasion. They not only relieve pain but, as has been ascertained by Winternitz and others, they also retard bactericidal development. To be efficient, however, the bags should be so arranged that the temperature will be kept constantly at that of melting ice and this involves a provision for drainage so that the water can run off as fast as the ice liquefies.

Among the diseases in which ice bags are of great assistance he mentions acute meningitis, acute mastoid disease, acute tonsillitis, lobar pneumonia, acute pleurisy, acute endocarditis and myocarditis, acute hepatitis, acute gastritis, acute rheumatic arthritis and acute synovitis, acute enterocolitis, acute peritonitis and acute pelvic diseases, acute cystitis, acute appendicitis, hemoptysis, hematuria, typhoid fever, scarlet fever, erysipelas (applied to region involved), neuralgia and headache.

### MECHANOTHERAPY

**A Note on the Value of Massage of the Stomach in Flatulent Dyspepsia (B. Statham, *London Lancet*, February 24, 1906.)** Statham reports a case of flatulent dyspepsia in a man who had suffered from the ailment for many years at intervals varying from a few days to sev-

eral months. The attacks came on suddenly and were accompanied with great oppression of the epigastrium, a feeling of general malaise, profuse sweating, and a small, rapid pulse ranging in frequency from 120 to 150 per minute. The attacks lasted from one hour up to

twelve hours and ceased spontaneously as suddenly as they began.

No drugs or external applications appeared to have any effect upon the trouble and he finally tried massage of the stomach during one of the attacks, the massage consisting of somewhat forcible kneading movements. He describes the results as follows:

"Almost at once gurgling sounds could be heard from time to time as if the contents of the stomach were passing into the duodenum, and within ten minutes the attack was at an end. This treatment has been tried on the same patient in two subsequent attacks, once by myself and once by a friend, with an equally favorable result on each occasion. It would appear from this that the attacks above described are brought about by a paralytic distension of the stomach due to gases produced by a fermentative process, and that the massage by stimulating the organ to action causes its contents to be passed on into the bowel. This view is supported by the fact that on one of the above occasions after the attack had been brought to an end by massage very large quantities of gas were passed per anum."

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Artificial Hyperemia in Surgery (*Alex. C. Wiener, Illinois Medical Jour., March, 1906.*) Inflammation is not a disease but a function of the tissues by which they protect themselves from enemies. It is analogous to a cough when a foreign body has lodged in the throat. The cardinal symptoms of inflammation are all a consequence of hyperemia, which results from either a retardation or acceleration of the blood current. Hence there is a venous or passive, and an arterial or active hyperemia. It is the

former type that characterizes inflammation for the removal of noxious substances and the formation of connective tissue. Active hyperemia is physiological in organs that are in activity. The most practical agent in producing active hyperemia is heat and of all the means of applying heat hot air has been proven the best.

Passive hyperemia is being used by various physicians in Europe and elsewhere with success and this paper deals with the results obtained in the clinic of Prof. Bier at Bonn, where cases of rheumatic and tuberculous diseases of the joints have been treated.

The passive inflammation is produced by the pressure of a bandage that must be carefully applied so that the circulation in the superficial veins shall be checked but the arterial flow be unimpeded. The part must be carefully watched so that damage to the tissue shall not be done by too great tension on the veins and capillaries and the pressure should be relaxed if there is any appearance of spots of vermillion hue on the skin or the extremities become cold, or if there be pain or other serious nervous symptoms. The duration of the pressure should not be over half an hour and this may be repeated once during the day. In some cases of tuberculous joints the bandage has been retained with profit for a longer period but no discomfort, pain, or edema must occur.

The bandage is not to be applied near the affected joint but at as high a point as possible on the limb. No satisfactory way of treating the hip joint has been devised so far, as the circulation can not be dammed back around the joint. In tuberculous cases complicated by fistula there is danger of mixed infection and

still the cases of pus infection are the ones that seem to be most favorably affected.

Immobilization of the affected joints is not employed and where the joint has lost volitional movement this is soon re-established under the use of the rubber bandage. Where ankylosis has occurred this must be reduced by mechanical force and the patient permitted as great freedom as is consistent with other conditions.

It is in the treatment of acute infections of the head and the extremities that Dr. Bonn deviates most radically from time-honored methods. He denounces all antiphlogistic methods and applies the elastic bandage to produce energetic stasis in the veins without causing pain. His indications for this treatment are (1) subacute inflammations of joints and soft tissues; (2) acute purulent infections of the soft tissues; (3) acute or subacute inflammations of joints and purulent arthritis, especially gonorrhreal arthritis. In such cases the bandage is at once applied for twenty or twenty-two hours. As soon as pain is caused the bandage is removed and re-applied in another place; the limb is not elevated and the joint is not immobilized. After temperature has become normal the pus is aspirated out of the joints or drained from soft tissue by small incisions. Under this method of treatment sloughing of structures does not occur and functional impairment is not permanent.

It is believed by the author that the success of Dr. Bier's treatment is due to the antitoxin that is accumulated at the seat of the inflammation and which, being retained there for an adequate time, arrests the growth of the bacteria.

The theoretical background as well as the successful experience in practice warrants a wider application of Dr. Bier's treatment.

**■ Rest and Exercise in the Treatment of Tuberculosis** (*John Edward White, New England Medical Gazette, March, 1906.*) This article is one of the clearest statements of the value of rest and of the proper place and relation of exercise in the treatment of pulmonary tuberculosis that has been published thus far.

The ample opportunity to observe the effects of various forms of treatment at the Nordrach Ranch, which has been a pioneer in the open air treatment of tuberculosis, enables the writer to speak with more than the ordinary authority, for this sanitorium, situated on the great mesa east of Colorado Springs and sheltered from the North wind by a great bluff of rock, has been the place of healing for many cases.

Success in the treatment of tuberculosis depends on the intelligent prescription of rest and exercise. These matters can not be regulated in private practice as they can be in institutions.

The thermometer should be the guide in determining when rest should be strictly observed. Until the temperature remains below 100 deg. F. for ten days, and the pulse is as low as 110 for a similar time, rest in the open air should be absolute. It may take weeks or months to bring the conditions to the above standard, but it is found that the period bears a close relation to the time leading up to the collapse from disease. If one has overworked for years, indoors, it will require from six months to two years to effect a cure.

It often appears that the temperature will drop within a few days after the

rest is begun but the pulse rate remains high. In these cases rest must be rigidly followed until the relaxation secures a suitable pulse.

In many cases there is a fear of fresh air and an aversion to it as the result of long habituation to indoor life. This must be overcome by sitting out of doors all day, without reference to the weather, and sleeping in a tent or veranda or in a room with all the windows wide open. The colder the weather the better the results, for we have in cold air our most valuable aid in reducing temperature. The patient need not be uncomfortable for the use of blankets and warm soap-stones prevents undue loss of heat.

The same therapeutic value is to be attributed to rest when the lungs are diseased, that is conceded to it when a surgical case is under treatment. Physiological rest is an essential to rapid recovery when there is organic lesion. When the temperature and pulse are essentially normal care must be exercised as to the amount of physical work that can be done. Walking seems to be the best form of exercise and for this the paths may be marked as to distance and ascent so that a prescription can be definite. The patient should walk alone

at first so as to avoid temptation to talk which should be avoided as an unnecessary addition to the work of the respiratory tract. The judgment of the patient should not be trusted as to ability for exercise or the effect of the exercise, but at this period of the treatment the most scrupulous care should be given to control the details of the patient's life, using as a guide the variations of pulse and temperature.

It is at this time that the patient is most likely to leave the sanatorium and its control. This is always a grave mistake, for relapses are likely to occur and the cure is delayed if not prevented. The flighty and poorly balanced individuals never do accomplish a cure; the well balanced, who are willing to do the right thing at all times and make everything subservient to getting well, are the only ones who stand a chance of cure.

Rest is the period of encapsulation of the bacilli and nothing that tends to break the wall surrounding the bacilli should be tolerated.

Tuberculosis is curable, but many patients have neither the patience nor the money to reach a cure. Restlessness is the great obstacle that stands between the patient and recovery.

## CLIMATOTHERAPY

**Human Blood-Pressure and Pulse as Affected by Altitude** (*Charles Fox Gardner and Henry W. Hoagland, The Medical Record, March 10, 1906.*) It has been observed that at a considerable height above the sea some individuals, otherwise healthy, suffer from a feeling of fulness in the head, breathlessness, quick pulse, hemorrhages from the nose, and even haemoptysis. These

manifestations have been regarded as due to an increase in the intra-vascular blood-pressure. The authors of this contribution believe it to be a point of much importance to determine definitely the nature of this influence exerted by high altitudes upon the heart and blood-vessels.

They call attention to the fact that we have a large and rapidly-growing popu-

lation in the Rocky Mountain districts who live habitually in an air-pressure on their bodies of 20 per cent. less than the air-pressure at the sea-level. This fact while increasing the importance of the subject, also furnishes added opportunities for investigating it. The facilities presented to the authors were exceptionally favorable. Their place or residence being at Colorado Springs, a city of 30,000 inhabitants, at an elevation of 6,000 feet above the sea-level and within five miles by electric cars of the Pikes Peak Railroad at Manitou, by which they could quickly reach the summit of the Peak, more than 14,000 feet above tide-water.

A further advantage possessed by these investigators were the privileges of a well-equipped scientific laboratory in the New Science Building of Colorado College, while from the college students they were allowed to choose any number of men desired for experimentation. The instruments employed were two Riva-Rocci, with 5 cc. cuff, and an instrument modified from the Janeway with a 12 cc. cuff. The construction of these new devices depends upon the principle of the mechanical constriction of a limb or finger, and using the blood-current thus modified to operate some form of index, as for example, a slender column of mercury in a glass tube, or a needle on the face of a recording dial. By these instruments it is possible to avoid the errors of the older methods. The individuals upon whom the observations were made were divided into groups, and the results obtained may be summarized as follows:

*Group I.*—Average pulse-rate and blood-pressure in men and women of all ages, resident at 6,000 feet altitude for

more than one year. Blood-pressure slightly lower than the sea-level normal; pulse-rate not increased.

*Group II.*—Average pulse-rate and blood-pressure in men who had lived at 6,000 feet altitude more than 25 years. It was found in these cases that the blood-pressure was certainly lower than that given for corresponding ages as normal at tide-water, while the pulse-rate was unchanged.

*Group III.*—Effect of muscular exertion upon college men. After determining the normal blood-pressure the men were required to exercise violently at football, running, etc. The result differed very little from that of similar experiments conducted near sea-level, *i. e.*, pressure was at first increased by muscular work and gradually returned to normal.

*Group IV.*—Observations on blood-pressure and pulse in 22 men and women, taken at elevations of 6,000 feet and 14,000 feet above tide-water. The technique in this series appears to have been unsatisfactory and the results indeterminate.

*Group V.*—Observations on pulse-rate and blood-pressure in 22 college men, taken from a level of 6,000 feet to one of over 14,000 feet, and effects of a stay of three and one-half hours at latter level. These men were selected from the class at Colorado College and were of practically the same age and occupation. For some weeks they were kept under observation at the Science Laboratory and their individual and average blood-pressures estimated. The normal pressure obtained was compared with the work of O. Z. Stephens of Chicago (*Jour. A. M. A.*, Oct. 1st, 1904). It was found that at 6,000 feet a lower

blood-pressure and a slower pulse-rate obtained, the comparative results being as follows:

	Blood Pressure.	Pulse Rate.
Colorado Springs		
(6,000 feet) ..	126 mm.	80
Sea-Level .....	130 mm.	82

The men were now transferred to the summit of Pikes Peak and taken to a room in a hotel, all excitement and exertion being avoided. They were again tested under the same technique. The result showed an average pulse-rate of 86, an increase of 6, and an average blood-pressure of 121, a loss of 5. After three and one-half hours at 14,000 feet the men were again examined. The pulse-rate had now gone up to 99 and the blood-pressure had fallen to 118. The men had taken some exercise such as walking, in the meantime.

The authors believe that an equilibrium is established, probably in a few days, at high altitudes, and the pulse-rate and blood-pressure return more nearly to the normal of sea-level. Their observations on employees on the summit of the Peak indicate that the vascular tension is always lower than the tension of the same individuals would be at sea-level. A rough ratio appears to exist between pulse-rate and blood-pressure; the more rapid the pulse, the lower the blood-pressure. Cases of mountain sickness were accompanied by a fall in the

pressure and a rapid pulse-rate. From their observations the investigators feel justified in offering the following suggestions:

Although the average pressure of the blood was not lowered more than 8 to 10 mm. of mercury in a diminished atmospheric pressure of 8,000 feet altitude, it may easily be seen that such a change from the normal continued for a considerable time might, under certain conditions, offer a positive, and possibly serious, interference with the mechanism of circulation. For example, in cases where, owing to changes in the heart muscle, the blood tension is already abnormally lowered, a further reduction would be dangerous. Conversely, in other cases, as in some forms of aneurysm with high tension, and in certain valvular lesions, the effect of altitude would be decidedly beneficial, and such cases have indeed come under the observation of the authors.

While these investigations have been of great interest and importance it must be confessed that we are not yet in a position to formulate positive conclusions regarding the therapeutic indications of the contra-indications of high altitudes. A further study of the effects of diminished atmospheric pressure on the venous and capillary circulation, of which we are as yet comparatively ignorant, will, it is hoped, yield valuable results.

## MISCELLANEOUS

**Treatment of Hydrarthrosis.** (*Dr. Dagron, Journal de Physiotherapie, March 15, 1906.*) True chronic hydrarthrosis is not an articular affection. It is primarily a disease of the extensor muscles of the thigh. The therapeutical conclusions are easy to

deduct. First, use a compressive bandage to hasten the resorption of the articular exudate. Then resort to progressive massage, passive mobilisation, and then active movements. The progression must be very slow and carefully watched.

**The Duties of the Hospital Directors toward Their Roentgen Assistants and Appointees.** (*Dr. Franz Kirchberg, Fortschritte Auf Dem Gebiete Der Roentgenstrahlen, March 28, 1906.*) Kirchberg quotes legal abstracts showing the duties of the employer to the employed as to their protection of life and health. In brief it is the duty to give every protection consistent with the kind of work to be done. Toward this end it is the duty of those in authority to provide all necessary means of protection against the ill effects of the rays, such as lead screens, opaque aprons, opaque gloves, etc.

**Concerning the Radioactivity of the Air of Davos.** (*F. Jessen, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, March 28, 1906.*) Several authors have demonstrated an inhibitory effect of the radium rays upon the growth of bacteria. Jessen exposed two plates of agar which had been inoculated with the *staphylococcus pyogenes aureus*. The one which had been exposed to the emanations from

the air of Davos showed fewer colonies than the control plate.

**Explosion of a Radium Tube.** (*Robert Abbe, Medical Record, April 21, 1906.*) Abbe was removing his radium from a silver tube by a thread tied about it when it stuck in the opening of the tube and he pressed it lightly with the end of the metal forceps. Instantly it exploded with a loud report, the glass being shattered into numerous fragments and much of the radium being distributed against the inner lining of the tube. At the same time he saw a cloud of the pulverized radium come from the tube as large as his hand and fall to the carpet. He was able to regain it, however, by chemical processes which were executed by Professor Pegram of Columbia University. It appears that the danger of an explosion from confined emanations of radium is therefore an accident to be considered and, in view of the great financial loss contingent upon the loss of the substance, quite seriously considered.

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RICHARD G. BADGER, Publisher, 194 Boylston Street, BOSTON



Special Plate LVI

RIGHT FRONTAL SINUS OCCLUDED WITH PUS; BEFORE  
TREATMENT

Made with a Roentgen 20-inch coil, anode 18 inches distant from plate, ten seconds exposure. Edinol and Hydrochinon developer.

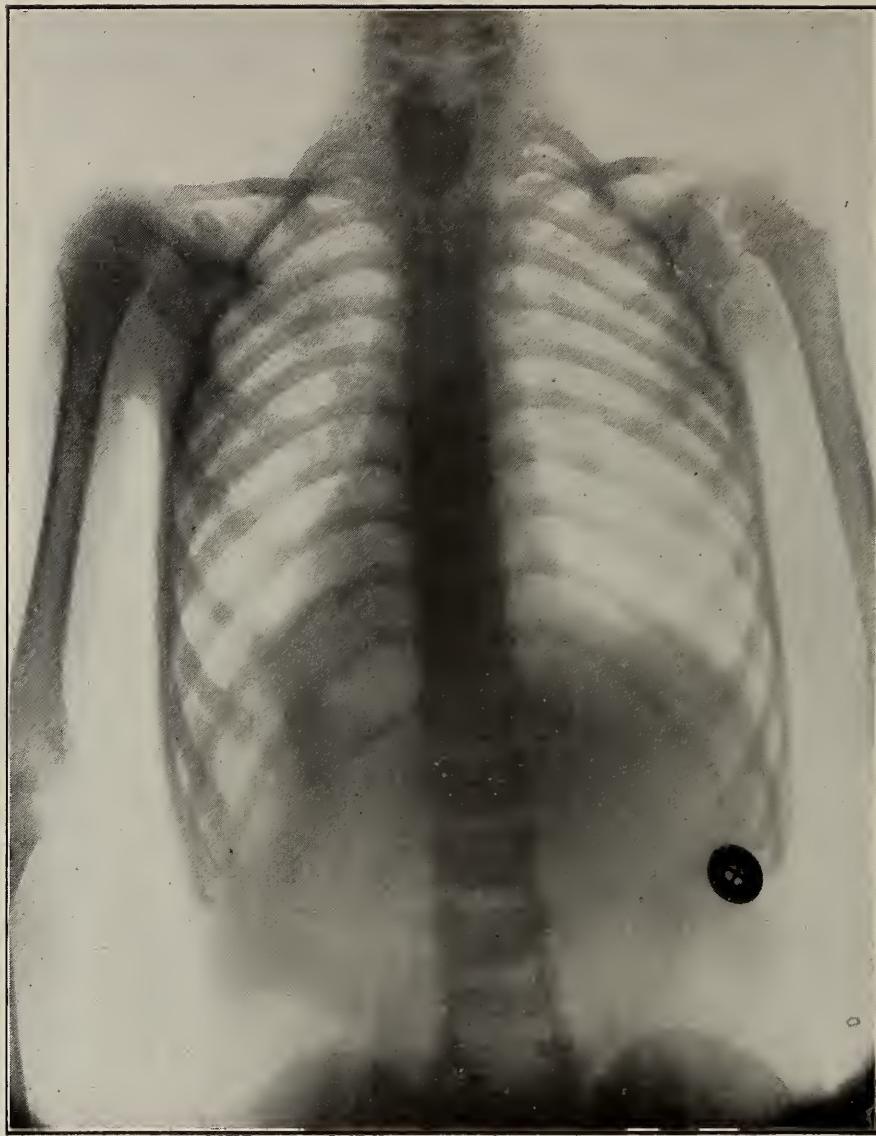
By Dr. George Edward Pfahler of Philadelphia, Pennsylvania.



Special Plate LVII

SAME SUBJECT AS PLATE LVI AFTER TREATMENT, SHOWING  
RIGHT FRONTAL SINUS PRACTICALLY CLEAR

Made with the same apparatus and technique as Plate LVI.  
By Dr. George Edward Pfahler, of Philadelphia, Pennsylvania.



Special Plate LVIII

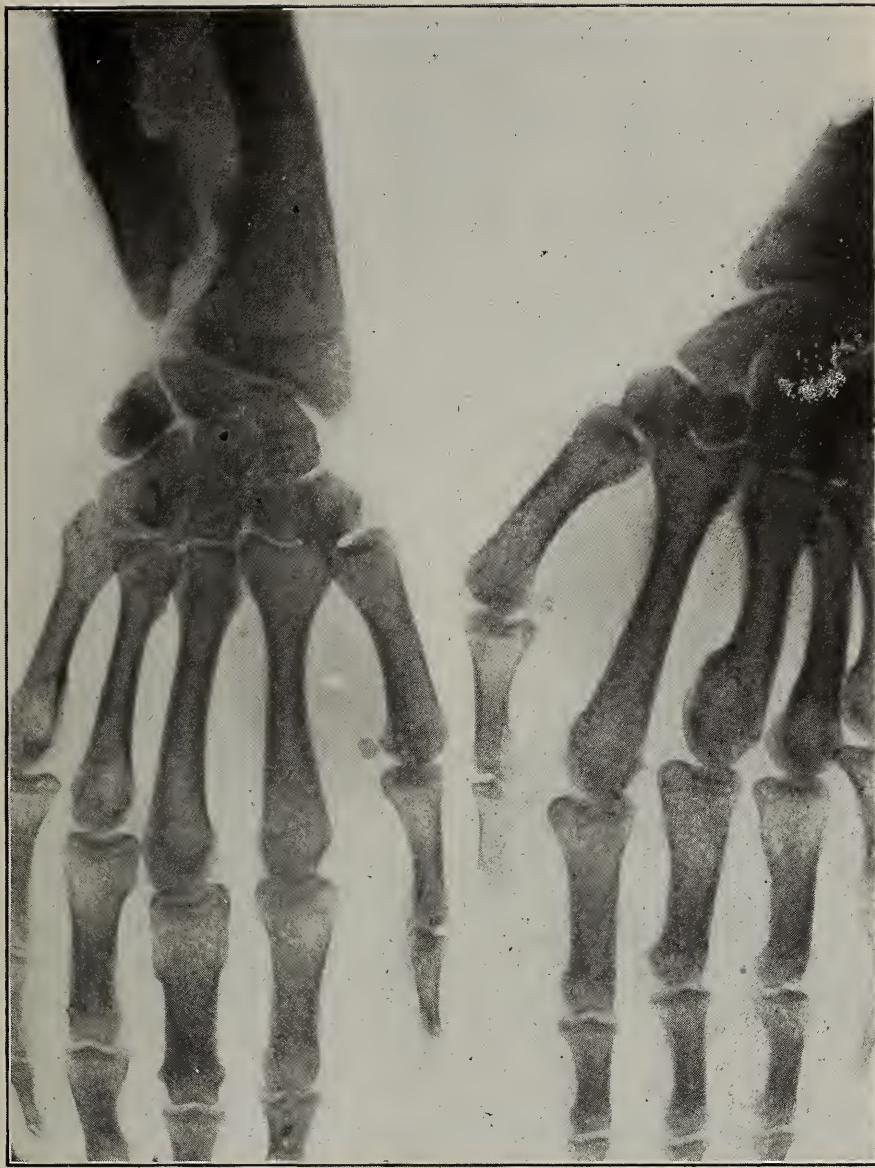
STRICTURE OF THE CÆSOPHAGUS

The patient was a boy five years old in whom a stricture had been produced by drinking lye two years previous to the making of the roentgenograph.

Before the exposure he was given bismuth mixed with simple syrup. The roentgenograph shows the pouch-like dilatation of the cœsophagus just above the stricture, which is seen to be located at the level of the sterno-clavicular articulations.

Below can be seen irregular shading produced by a few drops of the bismuth mixture which had trickled down.

By Dr. Preston M. Hickey, of Detroit, Michigan.



Special Plate LIX

EXOSTOSIS OF THE LOWER ENDS OF RADIUS AND URNA IN  
A GIRL FIFTEEN YEARS OLD

By Dr. Carl Beck, of New York City.



Special Plate LX

SYNOVITIS OF HIP JOINT

Medulla and structure of bone are shown, also line of attachment of capsule, which was distended with pus and thickened at its attachment with the bone. The muscles also show distinctly.

Made with an 8-inch coil using 15 amperes in the primary circuit, exciting a 6-inch tube, exposure 30 seconds. No compression blende or screen.

By Dr. Lewis Gregory Cole, of New York City.

# THE ARCHIVES OF PHYSIOLOGICAL THERAPY

*Devoted to the Diagnostic and Therapeutic Uses of Electricity, Radiant Energy, Heat, Water, Mechanical Vibration, Dietary Regulation, Exercise, Psychic Suggestion, etc.*

VOLUME III No VI

JUNE, 1906

WHOLE NUMBER XVII

## THE NON-OPERATIVE TREATMENT OF REDUCIBLE INGUINAL HERNIA

BY JAY W. SEAVER, A. M., M. D., OF NEW HAVEN, CONNECTICUT

*President of the Chautauqua School of Physical Education, Instructor in Physiology and Anthropometry in the New Haven Normal School of Gymnastics, formerly Associate Director of the Yale University Gymnasium, etc.*

FOR a period of nearly twenty years it has been my privilege to examine a large number of men annually and to go over them in such detail as enabled me to have fairly complete records of their physical size and condition. These men have mostly been students in residence in college and university although a considerable number have been in secondary schools, normal schools, clients in medical practice and applicants for insurance or civil service appointment.

The number of records that are thus available for study are somewhat over twenty thousand. In that portion of the material where all of the group were examined I have found that essentially three per cent of the men are ruptured, and a report of thirty-five thousand men collected from reliable sources where all of the group were examined shows that among university students slightly below three per cent. of the men are ruptured before entering college. The number of cases occurring while in college amounts to nearly one percent and the causes of the new cases are usually vio-

lent effort exercises, traumatism, and cough when the muscular condition is extremely poor.

Of all cases nearly fifty per cent. give a history of no special discomfort resulting from the hernia and a surprising number will not admit a previous knowledge of any abnormality, many saying when closely questioned that they had noticed the enlargement on one side but had paid no attention to it. It would almost seem that the cases that have had the greatest possible opportunity for care were the ones that had passed unnoticed. The number of cases that present a history of relatives who have been ruptured points to heredity as a prominent factor in the etiology of inguinal hernia. That a person should inherit an abnormally large inner inguinal ring or a thin and lax external oblique muscle is no more peculiar and exceptional than that he should inherit a specially large ear or a peculiar type of nose.

Among women, while my experience is not large, I have found that heredity plays a larger part in the causation of

the abnormality than it does among men, for slightly over ninety per cent. of my cases show a history of hernia in the family. In other words it would seem that the greater exposure of men to physical strains eventuates in a greater list of disabilities and it is also true that the size of the spermatic cord and its adnexa with the weight that it supports, is a factor that must be considered in the etiology of hernia.

While there has been some effort made to estimate the comparative weight that has to be borne by the internal ring, the result has been fruitless because of the inability to establish a standard for comparison that was in any way satisfactory. The presence of varicocele does not seem as important as would be supposed from the greater weight, as the preponderance in frequency on the one side does not give evidence of such influence. If this cause were active we should find that hernias would be twenty-five per cent. more frequent on the left side than on the right and this is not the case for the right seems to be affected as frequently as the left; and yet when a left hernia is developed in cases of varicocele the venous engorgement is usually made worse and complicates any form of treatment.

As most of the cases that have come under my care have been young persons, usually between eighteen and twenty years of age, I have found that a systematic training of the abdominal wall, so as to produce muscular firmness and strength, together with a supporting truss that would not prevent the drawing together of the walls of the rings, would produce a cure in a great majority of cases and this method of treatment has been under trial long enough to enable me to bring forward the evi-

dence of the permanence of the cures that have been reported before for short periods.

In order to appreciate the theoretical basis for this form of treatment I would briefly call attention to the anatomy involved in these cases and to the form of support that has been used with satisfactory results.

The abdominal wall in the inguinal region is made up of three muscles with their tendons that are in a certain sense consolidated and more or less involved in the formation of Poupart's ligament. The outer one of these muscles runs from its origin on the six lower ribs downward and forward to be inserted into the anterior third of the crest of the ilium, into the spine of the pubis and into the tendon of the same muscle of the opposite side, in the linea alba. The portion between the spine of the ilium and the pubic bone is rolled inward upon itself together with the tendons of the internal oblique at its lower half and of the transversalis in its whole extent, thus forming a strong ligament that is essentially eleven centimeters long, which forms the lateral anterior boundary and support of the floor of the abdomen.

The external inguinal ring is an opening about twenty-five millimeters long which is formed by a separation of the tendonous fibres of the muscle just before they enter the spine of the pubic bone, the upper segment running to join the tendon from the opposite side.

At a point about twenty millimeters above the middle of Poupart's ligament the fibres of the transversalis muscle separate for the passage of the spermatic cord in the male and the round ligament in the female, and the fibres of the internal oblique are at this point not close-

ly identified with the ligament but rise in a somewhat arched manner from the outer third of the ligament to coalesce with the tendon of the transversalis, so that it offers no real obstacle to the passage of a viscus from the abdominal cavity to the under surface of the external oblique muscle, the loose lower fibres having been picked up and stretched downward as the cremaster muscle.

The distance between the two rings constitute the inguinal canal and its length must be from thirty-five to forty millimeters. The posterior wall of this canal must be the tendonous lower portion of the two inner muscles that unite to form the conjoined tendon. The front wall of the canal will be the external oblique muscle, its floor will be Poupart's ligament while its roof will be the arch of the internal oblique and the fibres of the external oblique.

When once a body of suitable size has entered the canal there is no serious obstacle to its passage downward until it lodges in the pubic fascia or passes into the scrotum. The natural obstacle to hernial protrusion is obviously the tension of the external oblique muscle which not only holds a firm tissue over the inner ring but closes the canal entirely upon the cord or ligament. The inner ring being through between the fibres of a muscle will resist dilatation in direct proportion to the muscular tone or quality of the surrounding tissue which will easily stretch if the muscle is soft and flabby or will contract and hold firmly if the muscle is hard and strong.

In nearly every case of inguinal hernia, except the traumatic forms, the muscles of the abdominal wall are found to be relaxed and soft. Even among workmen this condition will be found to

obtain in such cases and an examination into the daily activity will show that much of the work has been done in a stooped posture. In a series of cases among farmers who might be supposed to get an even development from the variety of their work it was found that the poise in ordinary work was bad, the trunk being bent forward with the chest cramped and the abdomen relaxed. It will be noticed that the forward flexion of the trunk relaxes the external oblique and removes the tension over the inner ring and the canal. If any act of effort be made in this position the increased internal pressure finds no support and the ring permits the passage of the intestine into the canal. Among these fourteen farmers the average height is very much above the average for men, being five feet, ten and one-half inches and I am inclined to the opinion that this excess of height has induced more of a stooping posture than would be found among men of similar occupation who were two or three inches shorter.

With these points in view let us consider what may be done to restore a normal position and support of the abdominal organs when an inguinal hernia has appeared.

First the viscus must be restored to its proper place and this can usually be done best with the patient in the supine position with the thigh somewhat flexed on the abdomen toward the central line, and with the fingers placed below the tumor and its sides pressing in the direction of the canal. If this is not successful the hips may be elevated even to the extent of inverting the trunk and hot applications may be used with caution for relaxing the parts. Ether has been found of value when applied as a stupe over the tumor.

Care in diagnosis must be used for I have seen a case where the attempt was made to reduce the femoral hernia through the inguinal ring. In cases where there is strangulation the area of pressure should be broad and the touch should be gentle, bringing the pressure slowly upon the tumor in the direction desired and then continued for sometime, instead of a series of sudden impulses more or less fitful, always needlessly painful and usually inefficient.

Having returned the viscus to its proper place the problem of retaining

years, by the way, has been highly satisfactory in its results. The common purpose of wearing the truss is not curative but palliative although there have been a large number of devices that have aimed at the restoration of the normality of the parts by the aid of specially-devised pads some of which are constructed on correct principles and, with proper oversight, would accomplish a cure in many cases.

The pad that I have used with good results has been the ordinary hard rubber pad that is supplied with the best

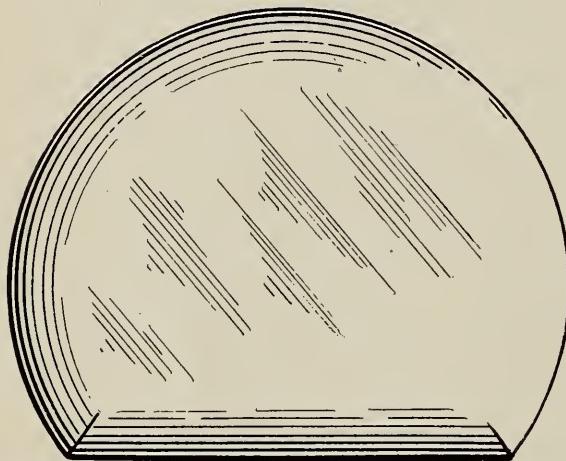


FIGURE I

View of Pressure Surface

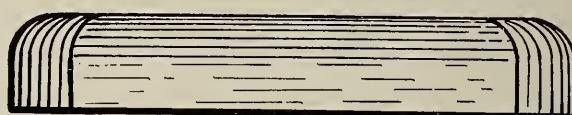


FIGURE II.

View of side which lies next to Poupart's Ligament

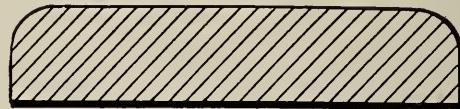


FIGURE III

Cross Section

## DR. J. W. SEAVER'S FLAT TRUSS PAD

it there arises. This is usually accomplished by the use of pads of various shapes and substances, held in place by belts of various kinds or by springs that fit over the hip so as to give a pressure inward over the ring. The usual form of pad is applied for the purpose of plugging the internal ring and is therefore sharply convex so that while it holds the hernia reduced it dilates the ring still more widely than it formerly was, and the person must either submit to the hardship of truss life or submit to a surgical operation which in later

grade of hard rubber truss, and this is worn for about a month, or until the patient has become adjusted to the truss and feels that he can be very active without displacing it. This process is like getting accustomed to wearing glasses that will drop off at first but that stay in place after one learns how to wear them.

When the patient is sure that the hernia is surely held and the exercises that have been taken have begun to tone up the tissue of the region, I remove the somewhat convex pad and apply to the

same spring belt a pad turned from hard wood or rubber that is perfectly flat, or even slightly concaved in some cases where there is a tendency to slip, with the corners rounded just enough to prevent chafing and with one side removed so as to fit against Poupart's ligament without being displaced by extreme movements of the leg. (See cut.)

This pad acts by pressing the external oblique against the inner ring and the canal, so as to obliterate it for the passage of any extra body. It offers no obstruction to the circulation or to the approximation of the pillars of the ring, and, as the muscle thickens the ring is partially closed as all apertures of the body tend to close when not stretched open frequently.

The development of the muscles of the abdominal wall tends to produce not only a firmer substance to support the internal organs but it shortens the muscles that were stretched and tends to put the internal soft structures into new relations to each other and to the abdominal wall. The sagging is corrected and the intestinal mass is raised in the abdomen, the pressure on its floor is greatly relieved and the tendency to recurrence of the hernia is reduced to a minimum.

Among the matters that seem of special importance in the way of physical training is the development of the thorax, as this is the roof of the abdomen and if it be broad and ample it will aid greatly in the support of the intestinal mass so that it will not press so heavily upon the floor of the abdomen. Further, it moves the intestines in the respiratory excursions of the chest so that a loop of the intestine does not lie with constant pressure against the ring and thus tend to dilate it.

Among the exercises that are of high

utility in securing strength of the abdominal wall I would call special attention to the volitional free exercises that can be performed with much exactness and perfection of control after a short time. Almost anybody can acquire the power of contracting either side of the abdominal wall while the other side remains quiescent, or he may contract the lower portion and make the contraction pass upward over the whole wall in a wave-like manner, that will lift the intestines and give such massage as will prove stimulating to sluggish peristalsis. The wave may be made to pass in the opposite direction but this is not so favorable to the position of the soft tissues for it tends to crowd them down toward the pelvis.

All movements that call into play the oblique muscles of the abdomen will be valuable in high degree and as the patient becomes accustomed to work with these muscles the severity of exercises should be increased until it approximates effort work. There need be no fear of injury if the patient does most of this work in the recumbent posture and it is necessary that the muscles be not only fitted to bear moderate strains but they must be fitted to bear extreme tension. This can be secured for any muscle or group of muscles by judicious training for an adequate period of time.

In estimating the probable results of this form of treatment among persons who are still in the growing period of life or who are in condition warranting active exercise, I have hoped to present a report of at least one hundred cases that have tried this method under my direction and have been without supervision or advice for at least two years, but the unwillingness of many to respond to a letter asking about purely

personal matters and the slowness of response in many cases where there is perfect willingness to report leaves me with only seventy-two cases for review.

Of these all but three were indirect hernias, and I may say that I believe that the ratio of direct to indirect inguinal hernias as stated by Cloquet, one to five, is not borne out by experience, with younger men at least. I would consider the ratio of one to twenty as nearer the experience of those who have dealt with cases where a whole group has been examined and where the cases are not seeking treatment at a hospital or in the office of the physician.

Of these seventy-two cases four were double hernias and one developed a hernia on the sound side after about six weeks of exercise treatment where each side did the same amount and kind of work. This I cannot explain. Probably there was an incipient hernia that lay in the ring on the unsupported side and under the violence of the work it was crowded into the canal. This case has been perfectly well for five years.

Seven of the cases were scrotal and four were slightly protruding from the

external ring. All of these cases were considered unfavorable for this form of treatment but seemed to repair even better than the simpler cases, which was probably due to greater strenuousness in carrying out directions because they were impressed with the severity of the condition. Fourteen of the cases (19.5 per cent) continue to wear trusses when taking vigorous exercise but not at other times, and five of them (6.9 per cent) say that they are "just as badly off" as they ever were except that they learned to take care of themselves and wear the support all the time. All the others (73.6 per cent) consider themselves sound and most of them keep up some form of exercise as a "constitutional" or as a preventive of a return of the hernia.

Of course it is possible that the cases that have not reported would not make as favorable a showing if they could be investigated, but even if they were all to be found unimproved the success of this method would recommend it as worthy of trial in selected cases and especially where surgical interference will not be accepted, and this class of cases is very large.

## THE APPLICATION OF GALVANISM TO THE TREATMENT OF FIBROIDS

BY FRANKLIN H. MARTIN, M. D., OF CHICAGO, ILLINOIS

**W**ITH the brilliant results of present-day surgery as a competitor one must have considerable courage to offer electricity as a remedy at all in these cases. But as an abdominal surgeon with at least average success, and at the same time as one who interested himself early and enthusiastically in the much-lauded Apostoli treatment when it made its

*debut* in this country, I am constrained by a sense of justice, knowing well both sides, to say in the interests of those who have fibroids of the uterus to deal with, that electricity may be used with benefit in a small percentage of such cases.

With a mortality in hysterectomies of three per cent. or less, in the hands of expert surgeons, coupled with the cer-

tainty of cure, the number of cases which may be justifiably submitted to electricity must be small. However, we know by experience that electricity seldom fails to relieve these cases, and while it frequently fails to cure, it never kills, never does harm, and never interferes with the success of an operation if in the end it does fail to cure.

Experience in the treatment of fibroids of the uterus by electricity has taught me how to select my cases, when to encourage a patient to receive electricity and when to encourage her to select an operation. Rules which I have formulated and allowed to influence, but not to control me (because I made frequent exceptions to them in individual cases), are as follows:

*When Electricity is Especially Indicated.*

1. In small bleeding fibroids in women approaching the menopause.
2. In inoperable cases.
3. In incipient, uncomplicated fibroids in women over forty years of age.
4. In small, uncomplicated fibroids of the smooth, interstitial variety which have no symptoms but hemorrhage.
5. In cases (not accompanied by pelvic pus accumulation) which persistently refuse to have an operation.

*Technique of Treatment of Typical Case*

A typical case for the successful treatment of fibroids of the uterus by electricity is that of the interstitial variety, in which the new tissue is uniformly distributed throughout the uterus, enlarging it to a symmetrical tumor, and proportionately expanding the uterine ca-

nal. These cases are almost invariably of the hemorrhagic variety, because of the expansion of the uterine mucous membrane. The hemorrhage occurs as an exaggerated menstrual flow.

We seek in these cases, (a), to transmit through the tumors, for its electrolytic effect, as strong a current of galvanism as the patient will bear without severe discomfort, and at the same time not to severely cauterize the tissue at the poles; (b), we seek to get at the positive pole which is placed in the uterus, acid accumulation of sufficient density to coagulate the tissues and thus lessen the bleeding; (c), this same acid at the positive pole we expect to combine with the copper of the electrode to form salts, which salts in solution will, by the cataphoric action of the current, be driven into the uterine tissues immediately surrounding the electrode, and as a styptic aid materially in curing excessive flow; (d), we seek further to obtain the powerful antiseptic effect resulting from chemical changes occurring around the internal electrode, in order to cure the endometritis which almost invariably exists as a painful accompaniment of fibroids.

After the antiseptic vaginal douche the patient is placed upon a table on her back, with her buttocks drawn well to the edge and feet supported by stirrups. The size, shape and direction of the uterine canal are obtained by the use of large, flexible sounds. A large copper electrode of suitable diameter is then properly shaped and passed to the bottom of the uterine canal, and the vaginal portion insulated with the rubber muff. This electrode is then attached to the positive terminal of the battery. A clay electrode, or the membranous abdominal electrode of the author, is next passed under the loose clothing and

placed on the abdomen, and then attached to the negative pole of the battery.

The current is now gradually turned on while the milliamperemeter is carefully watched and the features of the patient are closely scanned for signs of pain, until the current reaches one hundred to one hundred and fifty or even two hundred milliamperes, according to the tolerance of the patient and the size of the active, internal electrode. If the active electrode is of the ordinary diameter of from three to five millimeters, a current strength of one hundred milliamperes can be used safely in any particular case for every two inches of this electrode. To be more accurate, the current should not exceed in strength twenty-five milliamperes for each square centimeter of active surface of the internal electrode.

In the general run of cases one may safely give the patient as strong a current as she will bear without danger of producing excessive cauterization at the active pole. This will vary from one hundred to two hundred milliamperes.

The time of each treatment should be five minutes for the maximum current employed. The treatment should be given as often as every second day. Except in cases of continuous flowing the treatments are best given between the menstrual periods.

These cases begin to improve almost immediately. The first improvement consists in relief of neuralgic and so-called pressure pains. In a few days they find that their general strength is improved. Reflex disturbances, such as stomach symptoms, palpitation of the heart, occipital headache and backache will be relieved. The patient will begin to eat and sleep naturally. There is a

general feeling of well-being engendered. In a few days the leucorrhœa or purulent discharge from the endometrium will diminish. As the patient arrives near the menstrual period she finds that the old menstrual pains are not developing and the old despondency is absent. If the treatment has been sufficiently active the menstrual flow will frequently arrive without pain. Occasionally, the first month, the flow is fully as free as usual, although often it is much less. If the treatment is continued for two or three months these patients will begin to maintain that they feel perfectly well.

All the old distressing symptoms will very often disappear entirely, they will gain flesh and the uterine discharge will become normal. While the tumor will still be apparent to the physician's examination it will almost invariably be found to be much diminished in size.

When the time arrives, in the treatment, that these patients are symptomatically cured, that is, when they feel no symptoms, I usually discharge them. I always inform them that the tumor has not disappeared, and that sometime it may again give them the old difficulties. As long as they are free from these they may be satisfied that the tumor is not growing—that it is on the contrary decreasing in size. However, if the old symptoms begin to return, I instruct them to seek relief again in the electricity.

The above treatment applies to the typical, bleeding fibroids of the interstitial variety.

Where the uterus is large and the canal deep it is necessary sometimes to attack the mucous membrane by piece-meal, in order to get sufficient concentration with the dose tolerated to produce changes in the endometrium suffi-

cient to check hemorrhage. The concentration necessary should approximate twenty-five milliamperes for each square centimeter of the electrode in contact with the mucous membrane. For example, if a patient will only bear a current of one hundred milliamperes, one should select an electrode of copper, zinc, or platinum with a diameter of proper dimensions, insulated to all but four square centimeters of its distal end. The depth of the canal is measured. Then commencing with distal end of the cavity the exposed, active surface of the electrode is made to cover in successive treatments its whole surface. By doing this the whole mucous membrane is acted upon uniformly without employing at any one time a larger dose than one hundred milliamperes.

#### *Inoperable and Complicated Cases*

The cases which are referred to me for electrical treatment, in these days when surgery offers such a large percentage of recoveries from hysterectomies that it may be looked upon as a conservative remedy, are for the most part complicated cases which the ordinary surgeon shuns.

One complication which frequently induces the surgeon to shift the responsibility of these cases is that of severe, purulent metritis and endometritis, accompanied frequently with discharges of gangrenous masses from submucous fibroids, all accompanied with much pain, more or less hemorrhage and with the discharges inclined to be very offensive. The patients are usually poorly-nourished, with white and waxy skin in consequence of septic intoxication. When they reached this stage the tumors are frequently pronounced malignant. The

outlook for operation is certainly not encouraging.

In these cases we usually find a tumor of large size, extending perhaps to the navel. It is soft with nodular masses projecting from its peritoneal surfaces. The cervix is soft and patulous with a canal large and irregular. Sometimes a small, nodular mass is presenting at the cervix. This is usually soft and easily broken down. The endometrium and all cavities from which masses have been projected or from which masses have sloughed away, are infected and ulcerating and emitting a discharge which rapidly becomes offensive. From the large mucous membrane periodic and irregular uterine discharges are occurring, serving to swell the already copious outpour.

I have treated by electricity, and symptomatically cured, several of these cases in which a diagnosis of cancer had been made by men of more than ordinary talent.

I prefer, when it is practicable, to dilate the canals carefully in these cases and remove with a dull curette the superficial debris, before beginning with the electricity. I then select one of the largest copper electrodes which can be inserted and make it the active positive pole, inserting it to the bottom of the canal with its whole surface uninsulated. With the abdominal electrode in place a current is gradually turned on until a strength of two hundred milliamperes is reached, or the maximum amount under that strength that the patient will tolerate.

These treatments should be given every day. Antiseptic douches should be employed night and morning.

These patients respond rapidly. The powerful antiseptic action on the mucous

membrane makes itself apparent by the decreased odor of the discharge. The passing and withdrawing of the electrode opens the canal and provides free drainage for the secretions. The tissues become tanned by the salts of copper which are forced into them by cataphoresis, and the discharge of blood is lessened. The patient is toned by the general effect of electricity in her system. In a word, it is often marvelous what a transformation will take place in these apparently hopeless cases after a few weeks of judicious galvanic treatment.

While these cases are apparently hopeless, oftentimes being "given over" by the surgeon, they are able to be symptomatically cured by this simple remedy. I have a long list of such instances, and they constitute some of the most satisfactory results I have ever achieved.

#### *Inoperable Tumors Treated by Other than the Intrauterine Method*

There is a class of complicated cases of a different kind in which it is impossible, because of the contortions of the growth, to enter the uterine canal with an electrode. Occasionally the tumor had displaced the cervix so that it is drawn high up in the vagina above the reach of finger or sound, while again it may be drawn up posteriorly, the uterine canal forming an acute angle with the vagina. In all cases where it is impossible to reach the canal it is necessary, if they are treated by electricity, to employ it without the advantage of an intrauterine electrode.

Only in the most desperate cases, in which submission to an operation is clearly suicidal, and those cases are extremely rare would one think of employing electricity as a means of treatment when an intrauterine electrode is im-

possible. But it is in just these cases, with their distressing neuralgic and pressure symptoms, with dyspeptic and bowel irritations the result of reflex nerve disturbances, and in which an operation is discouraged, that we find patients reach to catch at any straw.

With an intrauterine electrode is not practical we should employ some other form of internal electrode which will have the effect of causing the current of galvanism to pass directly through the largest portion of the tumor. If the vagina is not so distorted as to prohibit the use of a vaginal electrode, that instrument should be used, placing its active point posterior to the tumor. This should be made the negative pole. The abdominal electrode should be placed in such a position that the largest diameter of the tumor is interposed between it and the vaginal electrode. A current of fifty to one hundred milliamperes may be safely employed, if tolerated, for a period of five minutes. The treatment may be given as often as every second day, and in a few cases every day where it is well borne.

When a vaginal electrode cannot be employed to advantage in these cases, a rectal electrode should be substituted. This should be placed well up opposite the tumor. It should be employed as the negative pole. It should have an active surface of not less than eight centimeters and the current should never exceed two hundred milliamperes.

All we can expect to accomplish in this treatment is that beneficial action derived from passing a strong, direct current through any tissue containing muscles, nerves, lymphatics and blood vessels, viz., powerful trophic stimulation to the part, and incidentally, a powerful general tonic effect on the entire system.

These cases get great relief. Neuralgias stop. Troublesome abdominal reflexes cease. Circulation is improved. Nutrition is increased. Sleeplessness disappears. Bowels are stimulated and relieved of troublesome distention symptoms. The tumors often seem to decrease in size. The degree to which each

of these symptoms is relieved varies much, of course, in individual instances. I have seen a large number of cases completely, and for an indefinite time, relieved of all these symptoms. In fact, some of the most gratifying cases of relief I have recorded have been of this apparently hopeless variety.

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### A MODIFICATION OF BENOIST'S PENETRAMETER\*

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ONE of the great draw-backs in the application of the Roentgen rays in medicine and surgery has been the lack of methods of exact measurement. This is especially true in the treatment of disease. Authors in reports of cases have, with their best efforts, tried to give an idea of the technique used in obtaining their good results by using such terms as a "soft," "medium," or "hard" tube. What one radiologist would term a hard tube, however, would be recognized by a second operator as a medium or soft tube. The terms are entirely too flexible and really mean little or nothing. Another method of estimating the penetrating power of the rays has been by measuring the parallel spark-gap. This too is very unreliable, because the resistance of tubes varies independently of the vacuum or the quality of the rays. Finally we have learned to use the hand and its shadows upon the fluoroscope as an indicator of the quality of the rays used. This has probably been found to be the most uniform in its application, but it too has many

serious objections and has probably done more damage to the hands of radiologists than anything else. It must therefore be abandoned.

The profession is indebted to Benoist for a most valuable device for estimating the quality of rays given off by each tube, and in terms which can be used and understood by every one. The Benoist scale is probably the most valuable instrument yet devised for accurate measurement of the Roentgen rays. By it we measure the penetrating power of the rays, or their quality. I therefore have taken the liberty of calling it a "penetrometer," a term that is less confusing than "radiochromometer." "Radiochromometer" is so easily confused with the "chromoradiometer" of Holzknecht which is supposed to measure the quantity of rays.

Benoist's scale consists essentially of a layer of pure silver .11 millimeters in thickness the shadow of which is compared with the shadow cast upon a fluorescent screen by layers of aluminum varying from one to twelve millimeters in thickness. The shadow cast by the

\*Exhibited before the Philadelphia County Medical Society, April 11, 1906.

## BENOIST'S PENETRAMETER

silver has been found to vary very little whether the rays be "soft" or "hard." Therefore the shadow cast by the silver is compared with that cast by the varying layers of aluminum. If, for example, the shadow cast by the silver is found to be continuous with that cast by six millimeters of aluminum, it is read as scale "6."

This scale should be used by every one, but there have been two serious objections to its use heretofore. One is the dangerous exposure of the radiologist to the rays while examining the scale through the fluoroscope. Any method of measurement necessitating such exposure must be discarded. The second serious objection to its use



FIGURE I

and which might render it inaccurate is the fact that as ordinarily used the tube must be tested before it is applied to the patient. We all know that during the time which elapses between the testing and its actual application to the patient the quality of the rays is likely to change. It is likely to change also while the tube is in actual operation. Therefore to make this scale practical it must be used at intervals during the exposure and such use must involve the safety of the radiologist.

To meet these indications and to overcome these objections, I have devised an instrument which can be used while the patient is being exposed to the rays with perfect safety to the operator.

This instrument consists primarily of

the Benoist scale. The scale in this instrument consists of a disk of silver one inch in diameter and .11 millimeters in thickness. This is surrounded by layers of aluminum varying from one to twelve millimeters in thickness, the whole forming a circle three inches in diameter (Fig. 1).

This scale is then mounted upon a barium platino-cyanide screen three inches in diameter. The scale-screen is then mounted upon the large end of a telescopic tube. This telescopic tube is made of tin and is twenty-eight inches long, three and three-quarter inches in diameter at one end and one inch at the other. Beneath the fluorescent screen is placed a mirror which reflects to the eye

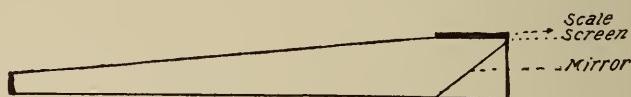


FIGURE II

the shadow cast by the scale. The complete instrument and the construction are indicated by Figs. 1 and 2.

This apparatus can be used while the tube is in action, by holding it directly between the tube and the patient. This becomes particularly important when we are using tubes with protecting shields which allow the rays to exit through only a small area and this in the direction of the patient. The radiologist stands to the side of the tube behind the protection while making the examination; therefore it becomes a safe method.

I believe this to be a distinct advance in the technique and the paraphernalia used in radiology. I publish this report at once so that it can come into general use and make our work and our reports more accurate.

## DRY HOT AIR IN THE MANAGEMENT OF SOME COMMON PATHOLOGICAL CONDITIONS\*

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THE technical exposition of subjects belonging in the special fields of medical practice, is rarely of much interest to the general practitioner, but there are some points in every specialty at which intimate contact obtains between it and the daily routine of the physician at large and such aspects of the specialties as are involved in these are vitally interesting to him. There are many such points of contact between physiological therapy and general practice, but few are of greater interest, and none are of greater importance, than those which involve the therapeutic application of dry hot air. Furthermore, these exhibit the great advantage of practical general utility, as any practitioner can readily acquire the apparatus and, by a little study of the appropriate literature and practice, the technical skill demanded for the proper and efficient administration of this remedial agent in these situations.

### *Physiological Action*

The intelligent consideration of any therapeutic agent with reference to the correction of a given pathological state demands, primarily, a knowledge of its influence upon physiological function, and we will first glance briefly at this phase of the subject.

There are two varieties of dry hot air applications : in one, the "local" application, only a small portion of the body surface is subjected to influence ; in the

other, denominated the "general" or "body" treatment, the greater part of the body, sometimes the whole of it excepting the head, is treated. The physiological actions of these two administrations differ in degree and, to a certain extent, in character, but as the general application is for several reasons impracticable for the average general practitioner, it may be at once dismissed from further discussion.

The physiological influence of the local application, then, is the one which concerns us at this time and this is dependent for its development upon (1) the stimulating effect of heat upon the nerve-endings in the skin, which induces reflex phenomena, and (2) the raising of the temperature, *en masse*, of the part treated, which modifies the chemical reactions involved in local metabolism and nutrition.

The first-mentioned results in (a) profound dilatation of the capillaries of the part treated and those parts in reflex physiological relation therewith, whereby is secured an emphatic local hyperaemia; (b) a notably increased functioning of the sweat glands, whereby the movement of fluids through the part is greatly accelerated and the local elimination of toxins markedly augmented; and (c) a reflex stimulation of the trophic innervation of the part, whereby the tissues are enabled to take advantage of the increased blood-supply to augment the nutrition and vitality of their component cells.

\* Read at the One Hundred and Forty-Second Annual Meeting of the Litchfield County Medical Society, at Winsted, Connecticut, April 24, 1906.

Raising the temperature of a substance facilitates chemical reaction among its component atoms, especially oxidation, and oxidation is the cardinal chemical reaction involved in metabolism, hence the second-mentioned primary element is ultimately active in the same direction as the first, viz., toward increasing the nutrition and vitality, hence the physiological resistance and recuperative power of the tissues influenced. The various elements of the physiological action of the local dry hot air application, then, may be summarized as follows:

First, an increased blood-supply to the part treated and to parts in reflex physiological relation therewith.

Second, the withdrawal of a large amount of fluid from the part by reason of the profuse perspiration induced.

Third, immediate relief of circulatory stasis, brought about by the two preceding phenomena.

Fourth, acceleration of nutritive processes through reflex stimulation of the trophic innervation and increased blood supply.

Fifth, facilitation of the chemical processes constituting local metabolism, through the elevation of the temperature of the part, *en masse*.

This temperature elevation would also tend to inhibit the development of such micro-organisms as were particularly sensitive to thermal changes and which might be present in the part treated.

#### *Therapeutic Indications*

The foregoing suggests that the pathological conditions in which the local dry hot air treatment might be expected to act beneficially, would be those in which the essential, primary pathology is strictly local and involves

a lack of vitality, power to resist pernicious influences, or of recuperative capacity, on the part of the threatened or impaired tissues, and that such desirable effects as were produced upon the organism as a whole would be secondary only, and proportionate, in degree, to the amount of improvement effected in the initial lesion; and clinical experience proves this expectation to be well-founded.

Prominent among the pathological processes owning such etiological and pathological characteristics are sprains, rheumatism, local septic infection or "blood-poisoning," and pneumonia, and the frequency with which these are encountered by the general practitioner invests them with considerable interest for him.

#### *Sprains*

In an uncomplicated sprain the lesion consists simply of a traumatic solution of the continuity of soft tissues about the affected joint, accompanied by severe pain which is probably due to circulatory stasis, and more or less impairment of function. The therapeutic indications are (1) to relieve pain, (2) to so influence the trophic functions as secure the quickest possible repair, and (3) to promote absorption of the exudate.

Theoretically, the physiological influence of the local dry hot air treatment should be most exquisitely applicable here; practically, clinical experience demonstrates the validity of the deduction. If a sprain is gotten under treatment by this agent within three or four hours after the injury has been sustained, the pain will be relieved within half an hour and all traces of the trouble will usually have disappeared within forty-eight hours. If the case

is three or four days old, however, and exudate is present to any great extent, complete removal of disability may require from one to three weeks; but the pain is susceptible of the same immediate relief as in early cases.

The local dry hot air application also serves as a valuable diagnostic test in these cases, by informing us as to whether or not a fracture co-exists. When such is the case the treatment will usually relieve the pain somewhat; less frequently it will not relieve it at all, and sometimes it makes it worse. Its power to effect practically complete relief of pain is so universally observed when the lesion is uncomplicated that failure is, of itself, almost positive evidence that a fracture is present.

#### *Rheumatism*

When I use the term rheumatism I wish to be understood as meaning true, rheumatic fever, not the various inflammatory, degenerative, and irritative processes affecting bone, nerve, and muscle structures which are so often miscalled by this name.

Dry hot air is capable of curing some cases of this disease, unaided, but the proportion of such cases is not large enough to justify confining our therapeutics entirely to this agent, and salicylic acid in some form, and in full dosage, should always accompany the thermal agent. When these remedies are thus combined, however, there results (1) immediate relief of the pain, however severe; (2) a shortening of the duration of the disease to from five to ten days; (3) lessening of the likelihood of cardiac involvement, because the rapidity with which control over the condition is obtained diminishes the time period during which the infection threatens structures other than those

originally affected. When this picture is contrasted with that resulting from ordinary anti-rheumatic therapeutics, the unspeakably beneficent *role* which dry hot air plays in the management of the disease becomes at once apparent.

Before leaving the subject of rheumatism I desire to say a few words in reference to arthritis deformans, which is so frequently and so direfully confounded with rheumatism. That they are so confounded is due to the fact that it is only within a very few years that arthritis deformans has been so studied and described as to render possible its differentiation from rheumatism, chronic gout, some forms of neuritis, etc., hence adequate knowledge of it has not yet become disseminated through the profession at large. But when we consider the pitiable straits to which the victim of well-developed arthritis deformans is reduced, when we think upon the long-sustained, intense suffering, the helpless, hopeless crippledom, the relentless extinction of the sufferer's usefulness in life, brought about by this pathological "Old Man of the Sea," and then reflect that had the disease been recognized early and the patient treated properly for the disease from which he was really suffering rather than for rheumatism, he would have been spared such unspeakably grievous affliction, we begin to realize how imperatively it is incumbent upon us to distinguish these diseases during their early stages. Ten years ago such distinction would not have been so important, because at that time no reasonably efficient management for arthritis deformans had been evolved, but today a large proportion of its victims at any stage can be restored to health, and nine-tenths who receive proper treatment early can be cured.

*To be continued.*

EDITORIAL

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THE ROUTINE EMPLOYMENT OF THE ROENTGEN RAY IN  
THE DIAGNOSIS OF FRACTURES

THE propriety of the demand that no fracture, disease, or injury of the bones should be treated without ascertaining its true nature by a Roentgen examination will ultimately be as surely recognized as were the laws of asepsis, no matter how many Thebans, highly efficient in theory but not painstaking in practice, ridicule the "particularist," who in the sweat of his brow gets his cases down on paper. It is admittedly a tedious process, extremely disliked by the patient who is thereby "subjected to a financial sacrifice simply to serve the interest of the physician" and, in addition, the risks of burning either the operator's hands or the patient himself, with a background of a possible damage suit, constitute a by no means attractive prospect. There is also urged against it the absurdity of insisting that the young, struggling beginner in practice, who is hardly able to pay his office rent, should buy an expensive Roentgen apparatus.

Thus the great man with the highly contented attitude commands a large audience in his indictment of the routine employment of the Roentgen method of fracture diagnosis. He is blessed with an eagle eye and a well-developed palpatory ability, which permits him to diagnosticate the details of the fracture more quickly and more cheaply than these dangerous and fallacious rays, and his results are so good! That there was a dislocation once in a while where a fracture was assumed, or a fracture where the patient was subjected to painful massage treatment, is of minor importance. Functional disturbance is an unknown consequence of fractures in his practice. After fracture of the lower end of the radius the patients always could move their fingers. What does it matter that the wrist itself is stiff? That will not send them to a premature grave. Or that there is *only* two inches of shortening in fracture of the femur? If the patient buys a high shoe he is still able to run. The projection of the overlapping bone-fragments is kindl and confidentially called *callus*, a "most desirable" formation, and the patient is to be congratulated on his deformity caused by this valuable osseous asset. The patient who hesitates to believe that a crooked limb

is just the thing he wants, is "troublesome" and "ungrateful", and since he is the exception he only demonstrates the wisdom of the rule.

This is no satirical exaggeration, but a cruel fact and anybody who observes thoroughly the conditions in a surgical clinic will find enough evidence of the truthfulness of these remarks.

It is true, on the other hand, that the Roentgen method entails some trouble. We are in full sympathy with the practitioner who has to struggle with enormous difficulties. And how well he does, on an average, in spite of so many adverse circumstances! But the public does not care for the struggling physician's hardships, nor does the average patient care for the differentiation between a simple and a comminuted fracture, or realize the significance of an intra-articular fracture in contradistinction to an extra-articular one. He only considers the naked facts, in other words whether the physician restored the shape and function of his limb or not. If his hand is deformed it surely was the physician's fault. And thus a jury will also decide because the technical difficulties which prevented the physician from ascertaining the true nature of the injury, will not appeal to them.

And science does not care either. It knows facts only. It has no understanding for the outcry of the poor physician. Nature goes its way, unconcerned whether we like its rules or not, but whoever disregards its rules will be punished for it. He who throws himself before a running locomotive will be killed no matter how many arguments he may find why this should not be done. Thus nature is often cruel. We are its slaves. All we can do is to submit to the iron rules which it dictates. Then let us try to understand them and if she is so kind as to give us the means of such wonderful insight into her workshop as is furnished by the Roentgen method, it is no less than criminal to be indifferent to it.

There is no physician, no matter how skillful and experienced he may be, who, in the great majority of fractures, is able to recognize their details. And even if his routine once in a while permits him to be correct in general, there is often, besides the main fracture-line, a small splinter, laterally displaced, which can be reduced by a slight pressure with the surgeon's thumb provided it is recognized, while unrecognized and left alone it may form a serious obstacle to function. If recognized only at a late stage when the

swelling has subsided, the tissue-changes are so great that they cannot be remedied, even after the splinter is removed. Would it not have been better had the surgeon, in such a case, taken the comparatively small trouble of ascertaining the presence of that splinter at once, instead of incurring the much greater one and being discontented with the result besides?

In view of these considerations, then, the physician should never attempt the treatment of a bone-injury unless the patient submits to a Roentgen examination. If the physician has no apparatus himself he must rely upon a *confrere* who has and be guided by his advice.

The Roentgen picture will also be his guide in the treatment. If there is no displacement in a case of fracture, manipulations must be avoided and immobilization in a comfortable position applied and in two weeks massage treatment can be begun, if there be any displacement reposition must be undertaken at once. This is done either under the control of the fluoroscope on a translucent table, the dressing being applied while the rays indicate whether reposition was successful or not, or a roentgenograph is taken and under its guidance the reposition is made. After a plaster-of-Paris dressing, padded with cotton layers at its ends only, is applied, a second skiagraph is taken through it, which shows whether reposition was complete or not. If it is not, the dressing is removed again and the malposition corrected. If difficulties are still encountered anesthesia must be employed. Should the efforts at reduction made under anesthesia, not succeed, the fragments must be exposed by the scalpel and brought into apposition by force. If these principles are adhered to, cripples from ineffective fracture treatment will become a rarity.

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### ELECTROTHERAPY

**Treatment of Cicatricial Strictures of the Urethra with the Electrolytic Needle.** (*S. B. Selhorst, British Medical Journal, March 24, 1906*). Selhorst mentions the fact that recurrence usually takes place after progressive mechanical dilatation of urethral strictures and he does not get any better results with circular and linear electrolysis. As the stricture is a new, fibrous formation he

conceived the idea of using an electrolysis needle, like that sometimes used to destroy small cicatrices and glands in the skin, with which the stricture could be punctured and electrolysis thus applied to its interior. The needle which he uses is that recommended by Professor Oberlander for removing the marks left by his treatment of stricture with his branched dilator.

Selhorst's method of puncture electrolysis is as follows: "After the dilatation of the constriction up to No. 23 of the Charriere gauge, either with Benique bougies or by internal urethrotomy, if the induration of the cicatrized tissue be very strong and the bore of the passage too small, I commence the treatment with the electrolytic needle. I first make a thorough and minute irrigation of the urethra with a solution of oxycyanate of mercury; I then insert Oberlander's urethrosopic tube, corresponding with No. 23-30 of the Charriere gauge, passing along the whole length of the stricture. In examining the urethra I slowly withdraw the tube until the surface of the constriction is shown in the opening. The needle, ending in a strong platinum point from  $1\frac{1}{2}$  cm. to 2 cm. in length, isolated almost quite close to its point, is forced to a depth of  $\frac{1}{2}$  cm. to 1 cm. into the fibrous tissue, according to the dimension, thickness, and hardness of the tissue. The needle is the negative pole of a galvanic battery, the positive pole of which, a large, moistened, wetted disc, is placed on the thigh or on the belly. I allow the electric current of from four to six milliamperes to work for three minutes. Before withdrawing the needle I interrupt the current, and drive the needle into another part. This operation may be repeated four or five times during a sitting, and, if executed by an expert hand, is not very painful.

"In cases in which the constrictions are extensive and thick, the operation may be practised in the beginning at least twice a week. Later, one sitting a week will suffice. After each sitting the urethra is duly irrigated with a solution of oxycyanate of mercury or of nitrate of silver 1 in 4,000. These

irrigations before and subsequent to each sitting are indispensable for the prevention of complications.

"During the six years that I have treated cicatricial constrictions in this manner, I have never met with such complications as epididymitis, cystitis, or 'bacteriuria,' etc.

"During the whole period of treatment a bougie is introduced once a week, followed by an irrigation with a nitrate of silver solution to promote reabsorption, and to maintain the passage of the urethra at the size required. The number of the sittings will depend on the extent of the stricture as well as on its thickness and hardness. Sometimes three or four sittings will prove sufficient sometimes, however, it does happen that the treatment has to be continued for several months."

The urethroscope renders it possible to observe the progressive changes as the parts regain their normal condition, the greyish color gradually changing to a pale red. When the whole surface of the affected mucous membrane has become of a reddish color he inserts a Benique bougie, size No. 25 or No. 26 of the Charriere gauge, and from time to time again uses the needle to destroy the remaining traces of the cicatricial tissue.

He has used this treatment during the past six years and has found the results to be permanent thus far. But the operation must be done by a specialist who uses the urethroscope every day, as a precise diagnosis regarding the location and depth of the injury must be ascertained before treatment is commenced. Four cases illustrating the method are reported.

He and Dr. Schoemaker have also treated hypertrophied prostates in this

way inserting the needle *via* the urethra. His method of procedure in treating the enlarged prostate is as follows :

" I insert, if possible, the largest tube of Oberlander's urethroscope right into the bladder, withdrawing it again until the tissue of the prostate is seen, which is easily verified with the aid of the urethroscope, and is further indicated by the suppression of the flow of urine. At the same time, with my finger in the anus, I determine the position of the tube. By these means the right place may exactly be chosen at which to force the needle through the tube right into the tissue of the gland. The needle must be armed with a very sharp platinum or steel point, 4 to 5 cm. long at least, in order to be able to penetrate deep enough into the tissue of the prostate. The positive pole, a large moistened disc, is placed against the belly or the thigh, in the same manner as in the electrolysis of constrictions.

" The needle—the negative pole—is thrust in to a depth of 2, 3, or 4 cm., according to the length and thickness of the prostate, whilst the needle may be traced with the assistance of the urethroscope, and with the finger in the anus. I now apply for three or four minutes a galvanic current of from 4 to 6 up to 8 milliamperes. Before withdrawing the needle I stop the current. By altering the position of the tube the needle may be used in different directions, so that a large part of the prostatic tissue may be treated.

" When the lateral lobes of the gland are very much enlarged, it would not be possible to reach them with the needles described above. In order to be able to treat glands so extensively enlarged I have had a needle made provided with springs, which, being thrust into the

prostatic tissue, will bend into the lateral lobes.

" To effect this manipulation we have placed the probe, ending in a steel point with a spring and very sharp, in a glass tube very smooth inside. This glass tube is inserted in the tube of the urethroscope, which is already placed ready for the operation.

" The loss of blood and the pain are very slight, as well as the reaction that is apt to follow each sitting, which will quite allow of two or three sittings a week."

Although the electrolytic method does not as yet rank among the recognized treatments of prostatic hypertrophy because of the incidental complications—abscesses, fistulas—and uncertain results, Selhorst believes that the method has a great future before it and hopes the other genito-urinary men will investigate it extensively in the near future.

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**Static Electricity.** (*John H. Burch, Journal of Advanced Therapeutics, April, 1906*). In 1902 Burch began his experimental research work regarding the comparative physiological effects of electrical currents of high potential and frequency. This experimental work seemed to prove that while the spark discharge from a coil or resonator, actuated by a static machine, is less potent in its effects upon photographic plates and micro-organisms, upon living animals the effects of the electrical discharges from both the coil and static machine were identical in regard to time and appearance. It also showed that the static machine possesses an advantage in regard to quiet discharges, from the fact that it is a continuous current generator having distinct polar effects,

as was demonstrated by means of experiments upon blood pressure.

This series of experiments convinced him at the time that the physiological and therapeutic effects of these forms of electrical energy are almost wholly the result of potential. The static machine was found to possess distinct polar effects that were apparently of considerable therapeutic value, from the fact that the clinician may utilize with accuracy a modality capable of combating specific morbid conditions, without resorting to the unsatisfactory methods of pure empiricism in each case presented. The clinical application of his deductions from experimental work with quiet electrical discharges has convinced him that we may prescribe these modalities with precision through sphygmomanometer findings, which instrument he looks upon as being as essential to the physical therapist as is the fever thermometer to the general clinician.

In conducting the above experiments fifteen healthy subjects were selected and divided into groups of five. A series of preliminary tests were instituted with the sphygmomanometer connected with the arm, for the purpose of determining as near as possible the normal arterial tension.

Twenty experiments were made with the Morton wave-current. Of this number, ten applications were made by piling a bundle of journals upon a foot-plate that was connected with the positive side of the static machine, the negative side being grounded. The subject sat upon the insulated platform with his feet upon the journals. The spark-gap was from eight to ten inches. A Holtz machine was employed with ten revolving plates of thirty inches in diameter, run at a speed of 420 revolutions per minute. The duration of each seance

was fifteen minutes. Of these ten applications there was in eight instances a rise of arterial tension averaging ten millimeters. In the remaining two there was a slight fall of two millimeters in one, and three millimeters in the other.

The remaining ten applications were made by means of a long spinal electrode of malleable metal placed over the entire length of the spinal column and attached by a flexible rheophore to the positive side of the static machine, the negative side being grounded. The speed of the machine and the length of the spark-gap were the same as in the other experiments. The duration of the seance was also fifteen minutes. Of these ten applications there was a rise of arterial tension in nine averaging ten millimeters, while in the remaining one there was a fall of one millimeter.

A very peculiar phenomenon was observed in connection with this modality. In the treatment of a case of arterio-sclerosis with interstitial nephritis, the blood pressure registered at the beginning of the treatment 250 millimeters. After a seance by means of a metallic electrode, as above described, there was a fall of 15 millimeters. A large number of tests were made later among patients suffering from interstitial inflammation of the kidney with high arterial tension, and in every instance there was found a marked fall of the blood pressure. In the treatment of two cases of parenchymatous nephritis by means of this current the same phenomenon was observed, only in these cases there was not an abnormally high tension.

His experimental work with the Morton wave-current with negative insulation was very unsatisfactory. A large number of observations made with this modality gave results most perplexing

and contradictory. At one time it caused a distinct rise of blood pressure and at another seance a distinct fall of the arterial tension. Clinically the same contradictory results were encountered. It certainly is a distinct modality and differs in its physiological effects from the wave-current as ordinarily employed with positive insulation. In the therapeutic application of this modality empiricism is the only guide.

It was found that both the disruptive and convective static discharges produce a marked rise of the arterial tension, and, apparently, without regard to the polarity employed.

The spark and spray are the oldest and perhaps the best understood electrostatic modalities. While we at present know but little of the exact physiological action of either, we have learned by the empirical use of the spark that it in some subtle manner profoundly affects nutrition and metabolism. While the Morton wave-current relieves stasis and imparts a normal vasomotor tone to the affected region over which it is applied, the action of the spark is still more profound in its effects upon nutrition and the metabolic changes of the tissues. It not only relieves stasis, but by its use exudates are absorbed and a renewed vasomotor tone is imparted to the affected structures. It increases cellular activity in dormant organs and awakens segmental spinal centers to send and receive with increased alertness their manifold stimuli. His experience with this modality has led him to believe that the only polar difference in the spark is intensity. The indirect positive spark with negative insulation is certainly by far less painful than the indirect negative with positive insulation, although the latter may, perhaps, be more penetrating in its effects.

With the spray, however, there certainly is a decided difference in the therapeutic effects of the indirect negative and positive discharges. While both cause a rise of blood pressure the indirect positive spray with negative insulation is by far more soothing, while the indirect negative is more irritating and efficient where a distinct counter-irritant is desired.

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**The High Frequency Current in Erythema Papulatum.** (*Alex. Gregor, British Medical Journal, March 24, 1906.*) The patient was a woman aged twenty-three, who came under the author's observation first in May, 1904. She had suffered from rheumatism more or less during the preceding two years, the larger joints being principally involved. Shortly after the first attack an eruption upon her face and arms was noticed, which has remained fairly constantly ever since.

"When she first came under observation she complained of pain mostly in the ankles and knees, which were slightly swollen. She was anaemic, and her general health poor. The heart and lungs were normal. The condition of the skin was as follows: There was an eruption on the back of both forearms, on the back of both shoulders, on the nape of the neck, and on the face, principally on the forehead and round the eyes, with a few isolated spots on the cheeks and nose. This eruption consisted of papules, varying in size from a millet seed to the size of a wooden match head. The smaller ones were of a red hue, which paled on pressure. The larger ones were firm and elastic to touch, and were of a deeper red, passing on to a blue colour. Some of them assumed a cyanotic appearance. All the papules were elevated above the

general cutaneous surface, and crowded together without any order. In some of the larger ones vesicles formed in the centre, which broke and dried up. In this case the papule tended to pass through bruise-like changes, and in the event of its subsiding altogether, as some did, a small pit of a bluish colour showed where it existed.

"Drug treatment was employed in the first instance. Internally, salicylate of soda, iodide of potash, iron, arsenic, and sulphide of calcium were given from time to time. Locally sulphur lotion, lead lotion, ungu. hydrarg. nit., and ungu. ichthyo. were applied. The rheumatism and the general condition of the patient improved somewhat, but the skin condition made no progress whatever, notwithstanding the fact that the treatment was persevered in till the middle of October.

"I then resolved to try the effect of the high frequency current, and from this time till the end of December the patient had in all 36 sittings, consisting of auto-condensation (300 milliamperes) for 20 minutes, and also the application of the 'effluve' to the affected parts of the skin sufficiently near to cause sparking. At the end of December it was noted that she was entirely free from rheumatism, and that the skin condition was very much improved. There were only a few isolated papules left, principally on the face. The skin over the affected areas was slightly pitted and deeply pigmented. Treatment was suspended during the month of January. She returned in the beginning of February, and as the papules on the face did not seem to be disappearing I gave her twelve more applications, with the result that the trouble cleared up. I saw her on January 30, 1906, when the following note was made : Rheumatism gone,

skin normal, all pitting and pigmentation entirely disappeared."

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**The Technical Effects of Electricity in Therapeutics.** (*William Benham Snow, Archives of the Roentgen Ray, March, 1906.*) Snow calls attention to the mechanical action of the various modalities in contradistinction to the chemical effects. Ionization and electrolysis produce destructive chemical effects.

For the production of mechanical action, a current must be employed of high potential and very little amperage, thus capable of great diffusion. The production of tissue vibration will depend upon the rate of alternation. Currents of low periodicity produce tissue vibrations that penetrate deeply, but with high frequency currents it is a question whether they penetrate or not. The results seem to indicate that the effects penetrate even if the currents fail to do so.

The degree and character of the mechanical effect produced depends upon the potential and rate of interruption. The mechanical action differs in effect according to the source of the current, thus the interrupted battery current, for instance, produces mechanical contraction of tissue over a limited extent except when applied to motor points. Currents of high potential, if interrupted at a frequency to which the tissues will respond, produce tissue gymnastics.

Currents of large amperage are largely electrolytic and slightly mechanical in action, while currents of high potential are slightly electrolytic and largely mechanical in effect. These currents of high potential are derived from a static machine or from dynamo currents transformed by coils in connection with

solenoids or resonators, but the currents from a modern static machine produce sensible mechanical effects unobtainable from any other type of apparatus.

Glass vacuum electrodes connected to one side of a static machine, the other side being grounded, produce distinctly marked muscular and tissue contraction; such effects can be obtained from no other current source.

The indirect spark from a static machine produces deep muscular contraction such as cannot be produced to the same extent and so painlessly with sparks from any other source. The static wave current is of extreme value and can be obtained from no other source.

The therapeutic indications for these currents are poor metabolism, congestion, and passive hyperaemia. Where a whole organ is congested the electrode need be placed in contact with but one side. A suppurative tonsillitis or felon may be promptly cured by the application of the static wave or by the application of a vacuum electrode or static brush discharge. The tissues are thereby contracted and relaxed until the induration is relieved and the blood flows freely. These currents are indicated in every form of congestive and hyperæmic processes, except those associated with specific and advanced suppuration, or the malignant con-

ditions, since they mechanically produce local and general functional activity, relieving stasis and restoring to the tissues a condition of normal elimination, secretion, and circulation.

**Pathogenesis and Electric Treatment of Asthmatic Attacks.** (*Denis Courtade, Bulletin Officiel de la Societe Francaise d' Electrotherapie et de Radiologie, March, 1906.*) The treatment consists in galvanization of the cervical part of the vagus. The active pole is placed first on the middle lateral part of the neck and next on the lower insertions of the sternocleido-mastoidian muscle. Said pole is formed by a circular pad  $2\frac{1}{2}$  inches wide of carbon covered with chamois skin and soaked previously in warm unsalted water. The indifferent pole is placed on the nape of the neck, or, in case of tuberculous pseudo-asthma, over the apex of the lung. This pole is formed by a 3 x 6-inch zinc plate covered with chamois skin or tinder and soaked in warm water. Current from 10 to 15 ma. No intermittances, no inversions, but we may use slow electric waves. Treatment lasts from 10 to 15 minutes. They are given two or three times in a week.

Essential asthma is the variety most favorably influenced. Cardiac asthma is seldom relieved.

### RADIODIAGNOSIS

**Fluoroscopic Examination of the Chest in Children, with Reference to Tuberculosis.** (*G. Barret, Archives d'Electricite Medicale, March 10, 1906.*) Patients should be examined in the standing position. Very young infants may sometimes be examined in the recumbent position on a cloth bed, the

tube being placed under the bed. When with such patients, an examination in the vertical position is absolutely necessary (pleurisy for instance) the child may be tied to a vertical frame. Examination is performed first in a frontal plane, then in a lateral position, and last in oblique positions. It is

useful to report the data on special charts representing a normal thorax. A roentgenoscopic examination is only one element of diagnosis and cannot be correctly interpreted without the help of all the other clinical methods.

Tracheo-bronchial adenitis reveals itself by abnormal shadows in the region of the pulmonary hilus, and varying considerably in size, shape and intensity. They may sometimes be mistaken for the aortic projection, but the latter is pulsatile. Lateral and oblique examinations cannot be dispensed with because the retrocardiac space does not always show well on a frontal projection. Sometimes an adenitis will escape detection even with the best conducted examination, so that negative results are not conclusive evidence. But such an occurrence is not frequent and roentgenoscopy remains the safest method of diagnosis.

Other shadows farther from the median line may indicate an inflammation of the lymphatic glands located in the angle of ramification of the bronchi. As such adenitis is very frequent in children who cannot be suspected of tuberculosis, Dr. Barret thinks it is only a common, non-specific lesion. Calcified glands are by no means infrequent and give a very opaque shadow.

Roentgenoscopic examination in cases of other forms of pleural or pulmonary tuberculosis in children does not differ in its results from those obtained in adults, except that early detection by this method seems easier in children. Dr. Barret calls attention to the unilateral limitation of thoracic movements as a good premonitory sign, and mentions the indications given by the mensuration of the cardiac area and the examination

of the costal angle, the value of which has been established by Bouchard, Balthazar, and Guilleminot.

**A Plea for the More Extended Use of the X-Rays as an Aid to the Diagnosis of Pulmonary Tuberculosis.** (*Stanley Green, Archives of the Roentgen Ray, April, 1906.*) The Roentgen ray will never replace the older methods of diagnosis, but in combination with the physical signs it is of extreme value, especially in doubtful cases and where one lung is involved. Green has repeatedly been able to demonstrate a lesion in a supposed healthy lung where the other lung was known to be affected. He places great importance upon the limitation of motion of the diaphragm upon the affected side. He has been able to carry out all his work, even the printing and toning of his prints in the midst of a general practice.

He disputes Williams' statement that there is a class of cases in which the Roentgen ray fails to demonstrate the presence of a lesion which may be detected by physical examination. He admits that this may be true if the examination is made by the screen alone, but if a roentgenograph be made by a competent operator, it will never fail to demonstrate each lesion that can be discovered by physical examinations, and will usually demonstrate the presence of a variety of lesions which such examination has failed to reveal. He considers Roentgen examination as of much greater value than even the examination of the sputum for the bacillus of Koch.

In making an examination the patient should be stripped to the waist in a perfectly dark room. He has a corner of his laboratory cut off by boarding and a thick curtain with an opening cut

in the front, covered with a thick, black material, over which opening the screen is arranged to move up and down with a counterbalance. The screen can be removed and a plate holder fixed in its place if it is desired to make a picture in the erect position. Being thus in absolute darkness, with the switch-board in easy reach so as to give him control of the tube, he examines the patient with screen to back and also screen to chest.

It has been pointed out by Lawson that the range of movement of the diaphragm when viewed from the back is less, if disease is more extensive in the posterior portion of the lung, than when the screen is placed on the chest. The tube is placed twelve inches from the surface of the chest, with the anode at the level of the ensiform cartilage, whereupon the diaphragm is seen to have a movement in ordinary respiration of about one-half inch on each side, but upon deep breathing it may descend two and seven-eighths on the right and two and five-eighths on the left, but if there be tuberculosis present this range of motion may be limited to any extent. The diaphragm may indeed even be motionless on the affected side. This he considers one of the earliest signs of pulmonary tuberculosis. The tube should then be raised about four inches and a general examination of the chest made, observing the slope of the ribs, the width of the intercostal spaces (less when contraction of the lung is taking place), the translucency of corresponding areas on the opposite sides and the change in translucency in respiration, which may vary from a faint shadow to a dense opacity. Some shadows light up with deep inspiration, others are unaffected. He attaches but little importance to the lateral oblique examination.

In roentgenographing the chest he uses a tube backing 12 centimeters of spark gap with 4 amperes at 90 volts in the primary and exposes from 30 to 60 seconds, using a Gaiffe D'Arsonval installation, small Chabaud-Villard tubes and Lumiere plates. He develops the plates himself, and is able to observe, during development, many things which cannot be detected without difficulty after the plate is fixed. Development is complete in 12 to 15 minutes. No plate is reliable for diagnosis unless the heart shadow and vertebræ stand out well and good detail is shown in the ribs.

**Radiography in Supra-Condyloid Fractures of the Lower Extremity of the Humerus in Children.** (*H. Judet, Archives d' Electricite Medicale, February 25, 1906.*) This is an exhaustive, richly illustrated study of that most important class of fractures. Roentgenography is very useful from a diagnostic standpoint. A profile and an antero-posterior roentgenograph are necessary. The profile view will show the backward and downward direction of the fracture and the antero-posterior displacements. The front view shows the transverse and slightly concave-superiorly direction of the fracture and the lateral displacement. Later on, roentgenography enables us to study defective union, shows us how nature corrects deformities, and how secondary deviations of the forearm are produced. It is unnecessary to insist on the capital advantages of roentgenography as a control of the correctness of treatment.

**Upon the Differential Diagnosis of Ureretal Calculi and the So-Called**

**Pelvic Shadows.** (*D. Albers-Schonberg, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, February 22, 1906.*) Albers-Schonberg calls attention to the ease with which calcareous deposits may be confused with ureteral calculi, and recalls that the subject was discussed at the Roentgen Congress, 1905, without coming to any definite conclusion. He says neither the position or the size will decide the doubtful question of these shadows. In general he says these deposits are small, round, and smooth, while the ureteral calculi are likely to be irregular or oval. The practical point to be gleaned from this observation is that the diagnosis of ureteral stone is rendered very much less certain by the finding of these shadows of phleboliths or other concretions in the pelvis.

In the future when an operation is considered in these cases it will be necessary to pass a metallic catheter into the ureter and repeat the roentgenograph. Even then the possibility of the catheter overlying the concretion occurs, but this error will be very rare. Finally a stereoscopic roentgenograph may be made.

**Concerning Stereoscopy and Stereoscopic Measurement in Roentgentechnique.** (*Dr. Druner, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, February 22, 1906.*) Druner reviews the principles upon which the stereoscope is constructed and then describes an apparatus which he uses to accomplish the best results. This apparatus consists of a chest or box which contains a movable and adjustable top which holds the tube. The bottom is made of aluminum and under this is placed a sliding board upon which the

plate is placed and moved inward half for the first exposure and the other half for the second exposure. He examines the negatives by means of a mirror stereoscope, the construction of which is carefully described.

**Very Simple Apparatus for Locating Foreign Bodies by Radioscopy.** (*L. Kocher, Bulletin Officiel de la Societe Francaise d'Electrotherapie et de Radiologie, March, 1906.*) Kocher's apparatus consists of two rods fixed in a parallel position and with sliding markers. Looking at the fluoroscopic image the hand or forearm (it is only for small parts) is moved until the foreign body is in a line with the front and back markers. The latter are then pressed upon the skin and the marks are made durable by touching with a galvanocautery. The depth at which the foreign body lies along this line is found by turning the arm so as to look at it from the side.

**The Question of Large or Small X-Ray Tubes.** (*J. Belot, Archives d'Electricite Medicale, March 25, 1906.*) Among the elements which influence the efficiency of a tube is the absorption by the walls of the tube. Some have contended that this absorption is greater with a large tube because even if the thickness is the same the rays have a greater mass of glass to go through. This is absolutely false, says Dr. Belot; the absorption is exactly the same if the thickness of the glass is the same. He gives a mathematical demonstration of the fact that the absorption is independent of the diameter of the tube. But what may explain a greater absorption in a large tube is that, the larger

the tube, the thicker the glass will have to be.

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**A Simple Penetrometer.** (*Theodore Schilling, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, March 28, 1906.*) Schilling offers, as a means of estimating the quality of rays used, the skeleton of a hand introduced into a glove and the glove filled out with wax. From the wrist portion of the gloved artificial hand, a handle projects which is shielded by a curved piece of lead. This at once, he claims, replaces the use of the human hand of the operator. The bones are the same. The wax about the bones takes the place of the soft parts of the living hand and casts the same shadow. This is a very familiar object to all, is cheap and can be made by the operator himself. It is in no way objectionable to the patient, as the ordinary skeleton hand, which has been suggested, would be.

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**A New Mercury Jet Interrupter.** (*Ch. Ropiquet, Archives d'Electricite Medicale, March 10, 1906.*) In the interrupters at present in use, the rupture is always produced simply by increasing the distance between two conducting, generally metallic parts. The aim is to have that increase of the distance as rapid as possible, but an arc or spark may always jump in a straight line by the shortest way from one of the conducting parts to the other. If we place between those parts at the same time that they are removed from each other, a sheet or a wedge of an insulating substance, the spark is obliged to follow an angular path between the two conductors; the length of the possible passage is therefore increased much quicker than the distance

between the conducting parts itself, the rupture is consequently much more sudden and the detrimental effects of the break spark are minimized.

Ropiquet's mercury turbine interrupter is based on this principle. It works on currents of from 100 to 220 volts without rheostat and without condenser, and enables the same coil to give sparks of from one to fourteen inches, at the will of the operator. Furthermore, a special device allows one to obtain a number of interruptions either equal to, or double, the number of revolutions of the turbine.

This turbine has two rotating mercury jets. The latter do not form one of the electrodes as in the ordinary turbines but constitute a bridge between two copper electrodes connected with the circuit that is to be interrupted, so that the circuit is closed when the jets of mercury fall on the electrodes. When, as a consequence of the rotation of the turbine, the jet leaves the electrodes, it strikes against a wedge of insulating substance (glass, ebonite, fiber) placed obliquely.

About eight pounds of mercury are required; this mercury is covered with two quarts of ordinary alcohol. The electrodes are two triangular blades so that by raising or lowering them a wider or a narrower part is exposed to the contact of the mercury jets, and therefore the duration of the interruption is modifiable. The turbine is turned by a small electric motor.

Nothing wears out in this apparatus. The mercury becomes somewhat oxidized but that is easily washed off. No rheostat, no reducer of potential, no condenser, is required; the primary current may be easily regulated from a fraction of one ampere to fifteen amperes

or more, by simply turning a button. It gives as many well-fed sparks as the Wehnelt and consumes five times less electricity. The number of interrup-

tions may be either the same or twice the variations produced by the rapidity of the motor. The utilization of the current is excellent.

## RADIOTHERAPY

### The Rationale of the Roentgen Ray.

(James W. Hunter, *American Journal of the Medical Sciences*, March, 1906.)

The author believes that roentgenization destroys malignant tissue without injuring the surrounding healthy cells simply because such tissue has a lessened resistive power against destructive agencies. The rays produce only inflammatory conditions and these range in degree from the simple rubefacient action of turpentine to the absolute destruction of the actual cautery. There occurs a dissolution of the rapidly growing, relatively instable malignant cell and its replacement by scar tissue. He also believes that small doses of the ray stimulate as do small doses of poisons, hence insufficiently intense roentgenization will defeat therapeutic aims.

This agent is not generally effective in the treatment of deeply located growths because of the tissues through which it has to pass before it reaches the cells to be influenced. A few layers of gauze even will cut off a large proportion of the rays.

The Roentgen ray splits up silver chloride and silver iodide into their component parts, metallic silver and chlorine or iodine, and Hunter does not think that enough consideration has been given to the probability that the ray may produce much of its curative effects through an exercise of this same dissociative power upon the component substance of the highly complex embryonic (malignant) cell. The fluo-

rescent properties of living tissues may also be excitable by roentgenization and may constitute active factors in the influences observed: The cacodylate of sodium, administered internally, has given Hunter "much quicker" results than he was able to obtain without it.

Three cases are reported. The first, an epithelioma of the vulva, healed entirely under roentgenization but recurred and the patient refused further application, dying ultimately from general carcinomatosis. The second was a case of Hodgkin's disease which showed great improvement and is still under treatment. The third was a bad case of lupus vulgaris which was cured.

Treatment of Malignant Disease by the X-Ray. (J. C. Rankin, *Archives of the Roentgen Ray*, April, 1906.) Rankin has treated seventeen cases of carcinoma, six being recurrent scirrhus of the breast, following amputation, using both soft and hard tubes and a sufficient dosage to cause reaction which always was allowed to interrupt treatment. Aside from lessening the pain no results were obtained. The progress of the disease was not arrested. In two cases of carcinomatous degeneration of lupoid scars on the back of hands and the elbow the rays were used for a week, then amputation of the shoulder joint was performed. In spite of this both patients died in less than two years. In twelve cases

of sarcoma treated nine are dead, yet there is some promise that the rays have a certain influence.

Most of his cases were rayed for five minutes at a time.

In rodent ulcer, five minutes exposure three times a week, with new soft tubes, produced a series of good results in thirty cases.

**Concerning the Roentgen Treatment of Sarcoma.** (*R. Kienbock, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, March 28, 1906.*) Kienbock has collected 97 cases of sarcoma from medical literature and reports ten of his own cases. From a study of these cases he concludes that roentgenotherapy in sarcoma can show good results. The effects are both local and general. The local effect consists of a decrease in the size of the swelling, a healing of previous ulceration and a relief of pain. The effect upon the general health during the treatment of a sarcoma by local exposure consists in an increase in the strength, appetite, and sleep, and objectively a decrease in the anaemia, an increase in weight. On the other hand a toxemia is noted during the treatment, especially in the cases which decrease very rapidly or which are treated heroically.

Of 90 inoperable cases 16 tumors disappeared, 52 decreased in size and 22 showed no effect. Practically three-fourths of the cases show improvement, and of the cases that are improved one-fourth of the cases recover.

The author has made eleven tables. His seventh table shows that the effect upon the sarcomata of the various types was about the same.

His eighth table shows that the sarcomata affecting the skin and the lymphatic glands give better results than those affecting the other tissues.

In thirteen cases showing a disappearance of the tumors, no signs of recurrence had developed up to the time of the report which had been from three to twenty-four months. The author concludes therefore that we have a right to assert that roentgenotherapy can produce a complete cure of sarcoma.

Kienbock does not believe that the rays cause the tumors to grow, or that they produce metastases or cachexia, but that in the cases in which these symptoms were observed the rays simply had not checked the disease and it progressed in its usual course.

He declares that radiotherapy should precede operation and in some instances operation will not be found necessary; he does not find that the chances of recovery are lessened by the delay. Sarcomas involving the skin and the lymphatic glands should be treated by the rays, as well as all inoperable and recurrent sarcomata.

**Technique.** The tube should be from medium soft to hard, depending upon whether the tumor is on the surface or deep. The distance should be from 10 centimetres in superficial to 20 centimetres in deep-seated tumors. Treatment should be carried to the point of producing a redness of the skin or a tanning.

**Roentgenotherapy in White Swelling and Bone Tuberculosis.** (*P. Redard, Archives d'Electricite Medicale, February 25, 1906.*) In chronic tuberculous osteitis, roentgenization is rapidly curative when the lesion is superficial, even if there is a fistula (fingers, toes). When the lesion is deep the action is slower and less favorable. No results in Pott's disease or hip disease. Sometimes there is, however, a local improvement.

In cases of chronic tuberculous osteo-

arthritis without sinus, roentgenization exercises a favorable influence only in very superficial and recent lesions. When a sinus exists, no results, but never have the writers observed any untoward effects. In half-healed lesions with a marked tendency to ankylosis, this method may sometimes influence favorably the production of fibrous tissue.

The technique is to give during several minutes massive doses of sufficiently penetrating rays (4 to 5 H., rays No. 7 Benoist). Treatment is given every two weeks. When possible, attack the lesions from several sides.

**Concerning the Roentgenotherapy of Pseudoleukemia and Other Blood Diseases.** (*Paul Krause, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, December 21, 1905.*) Krause states that more than one disease is usually classed under the name of "pseudoleukemia," and classifies his cases as follows:

1. Symmetrical Lymphatic Tumors (Hodgkin's Disease).
2. Typical Pseudoleukemia with and without Lymphatic Tumors.
3. Lymphosarcomatosis.
4. Lymphatic Tuberculosis.
5. Splenic Anaemia.
6. Splenic Tumors of Unknown Origin.
7. Struma Lymphomatosa with Mediastinal Tumors.

He reports two cases of Hodgkin's Disease in which the results were not brilliant, but he thinks the disease was retarded.

Two of his cases were of typical pseudoleukemia. One of these was practically cured while the other showed no beneficial result whatever.

He reports two cases of lymphosarcoma. The first case showed no

improvement after 360 minutes exposure and the treatment was discontinued. The glands had increased in size while under treatment.

The second case of lymphosarcoma had been treated to the extent of producing a Roentgen ulcer on each side of the neck. These did not heal before the patient died.

His eighth case was one of lymphatic tuberculosis. He gave in all 480 minutes exposure with no result, and concludes that lymphatic tuberculosis is influenced little or not at all and advises surgical measures.

His ninth case was one of splenic anaemia. After 1,500 minutes exposure in about three months the erythrocytes arose from 3,200,000 to 4,200,000 and the leukocytes were reduced from 10,800 to 4,200. There was no reduction in the size of the spleen. The tenth and eleventh cases were also splenic anaemia and the results were practically the same as in the ninth case.

The twelfth and thirteenth cases were splenic tumors of unknown origin. The general health of the patients improved but the size of the spleen remained unchanged.

The fourteenth case was lymphatic struma with mediastinal tumors. The tumors were decidedly reduced.

Two cases of pernicious anaemia were treated without result.

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**Treatment of Morbus Basedowii by Means of Roentgen Rays.** (*R. Stegmann, Wiener Klin. Wochenschrift, No. 26, 1905, and No. 3, 1906.*) The author reports three cases of Basedow's disease treated with Roentgen rays.

*Case I.* Patient has noticed goiter during past five years, also palpitation of the heart, exophthalmos, nervous-

ness, dyspnoea, profuse perspiration, weakness. Lost forty-four pounds. The circumference of neck is thirty-nine centimetres, pulse between 110 and 130.

May 26. First radiation eight minutes, medium soft tube, distance forty centimetres.

May 29. Patient felt better. Pulse 110. Second radiation fifteen minutes.

May 31. Patient more quiet. Third radiation eight minutes.

June 3. Fourth radiation, eight minutes. Pulse 80. Patient very quiet. Circumference thirty-eight centimetres. Attacks of dyspnoea less frequent.

June 8. Circumference of neck thirty-seven centimetres. Pulse 90 (patient had walked to treatment very rapidly). Since last sitting no more dyspnoea. Patient able to do her house work. Fifth radiation, fifteen minutes.

June 20. Circumference thirty-seven centimetres. Pulse 80. Tumor harder to the touch. Sixth radiation. Patient working again.

*Case II.* Morbus Basedowii incipiens. Tumor, tachycardia and nervousness disappear after three weeks roentgenization and patient, a pianist, is able to appear in public concerts.

*Case III.* L. T. 14 years old. Tumor since her fourth year, later nervousness, exophthalmos. Strophanthus, Rodagen, Moebius' serum and electrization without benefit. Patient lost last year thirty-eight pounds.

When she entered the hospital there was a moderate exophthalmos, diffuse, soft, pulsating tumor, tremor of all extremities and the body, skin moist, pulse irregular, between 130 and 150. Circumference of neck thirty-two and a half centimetres.

Treatment consisted of roentgenization with medium hard tubes, distance forty centimetres, duration on an average twelve minutes.

July 3, 1905. First radiation twelve minutes.

July 7. Second radiation, fifteen minutes. Patient feels better.

July 10. Third radiation, fifteen minutes. Circumference of neck thirty-one and a half centimetres. Pulse 120. Appetite good. Weight fifty kilograms (46.7 when she entered).

July 14. Fourth radiation, ten minutes.

July 19. Fifth radiation, twelve minutes. Weight fifty-two and nine-tenths kilograms.

July 24. Tremor almost entirely gone, less perspiration, general condition very good, pulse 110, weight fifty-four kilograms. Patient is sent into the country.

Sept. 11. Patient weighs sixty-two and nine-tenths kilograms. First menstruation middle of August. Pulse 100. Could walk four or five hours without getting tired and without dyspnoea. Circumference of neck is due to the laying on of fat, the thyroid gland only at right side a little enlarged.

Sept. 13. Sixth radiation ten minutes. Radiation of the right side.

Oct. 6. Seventh radiation twelve minutes. Pulse between 90 and 100.

Oct. 26. Weight sixty-six kilograms. Palpitation of the heart has ceased.

Nov. 10. Weight sixty-six and one-half kilograms. Pulse 88. The thyroid gland is normal. Patient presents the appearance of a perfectly healthy and normal person.

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A Case of Mycosis Fungoides Successfully Treated by the X-Rays. (G. G.

Stopford Taylor, *London Lancet*, March 24, 1906.) This case occurred upon the person of a man forty-seven years of age and was treated in the Liverpool Skin Hospital. The history was as follows:

"In January, 1903, he first noticed a reddish painless lump of the size of a walnut over the middle of the spine. He did not apply any remedies and after two or three months the lump disappeared. Before its disappearance five small similar tumours appeared over his left ribs. They never attained a larger size than that of a bean and went away spontaneously about the same time as the large lump. For about 12 months he enjoyed good health and saw no more tumours. At the end of that time there appeared scattered over his back a number of painless, reddish lumps of various size which were freely movable. So far as the patient observed, his general health did not seem to be affected by them. The tumours grew slowly but steadily. When he presented himself at the hospital on December 18, 1905, there were scattered over his back a number of tumours of varying size; three of these were large, the largest being of about the size of a duck's egg. Large areas of the adjacent skin showed the premycotic condition, which in this case was of the erythematous type, one large disc being very distinct. One of the smaller nodules was removed for the purposes of histological examination, which was made by Dr. F. Perera Wilson. On cutting into the tumour it appeared to the naked eye as a round mass, much denser and firmer than the surrounding tissue and sharply marked off from it. Microscopical examination showed a round mass of densely packed cells in the corium. The cells consisted of

connective-tissue cells of various shapes, numerous small round cells, and a few plasma cells. No mast cells were found. In some parts the cells were less deeply stained and were crenated in appearance; granular debris was scattered between them. In some parts of the specimen, especially round the periphery the cells were arranged in columns. Outside the main mass foci of cells were scattered through the corium. The epidermis was thinned and its inter-papillary processes flattened out; there was intercellular oedema.

"Treatment by the X-rays was given by Dr. Walter C. Oram who is in charge of the electrical department of the hospital. Exposures of ten minutes' duration each were employed twice a week at a distance of nine inches from the anticathode, 0.5 Holzknecht's units being administered at each sitting with rays of penetration seven on Benoist's scale. In all 15 exposures were given. The facility with which the tumours yielded to the treatment was remarkable, since improvement was noticed after the third sitting and they were completely level with the skin before the hair fell from the adjacent parts of the back. Although the patient was not aware of any deterioration of his general health while the tumours existed he says that since they have disappeared he has felt much stronger. His friends have also told him that he is looking better."

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The Evolution of a Case of Mycosis Fungoides under the Influence of Roentgen Rays. (*Charles J. White and Frederick S. Burns, Journal of Cutaneous Diseases*, May, 1906.) This is a beautifully illustrated and, as far as everything but the roentgenotherapy is concerned, very exhaustive report of

a case occurring in a man fifty-two years of age; the disease had been in existence three years. Under roentgenization marked improvement was noted in the lesions but the patient died from streptococcus toxemia. The authors consider that this case should constitute an emphatic warning regarding the possibility of bringing on a fatal toxemia in cases undergoing applications of the ray. It is to be regretted that the details regarding the number of roentgenizations and the technique employed were not stated.

**Roentgen Rays in the Treatment of Lipoma.** (*F. Barjon, Archives d'Electricité Medicale, March 25, 1906.*) The author has treated successfully two cases. The first is that of a man who had a large diffuse lipoma of the neck and another lipoma in the lumbar region. Thirteen treatments were given on the neck and ten on the lumbar region. The total absorption approximated 16 H. for the neck and 12 H. for the lumbar tumor. Rays No. 5 or 6 Benoist. The tumors subsided very satisfactorily.

The second case was a man fifty-eight years old, who was treated by roentgenization for myelogenous leukæmia with splenomegaly. He had a fairly large lipoma on the left hypochondrium, near the splenic region. When the absorption of the spleen had reached about 18 or 20 H. the lipoma had markedly decreased. Only three other similar cases are recorded in literature. Dr. Barjon thinks the action of Roentgen rays on lipomas is absolutely different from that on malignant growths, and is explained by the action of the rays on the blood vessels and capillaries, which are essential for the development of fatty tissue.

**The Roentgen Treatment of Some Non-Malignant Superficial Lesions.** (*Charles L. Leonard, New York Medical Journal, April 28, 1906.*) Leonard reports four cases of goitre which he has treated with the Roentgen rays with good results. One occurred in a young girl of eighteen years and had existed for three years; in this case the condition entirely disappeared under Roentgen radiation. In the other three various grades of improvement as regards local and general conditions were observed. He also speaks well of roentgenization in sycosis, favus, ring-worm, alopecia areata and hypertrichosis. No details regarding technique are given.

**The Effect upon Glandular Tissue of Exposure to the X-Rays.** (*W. J. Taylor, Annals of Surgery, March, 1906.*) Taylor is strongly opposed to roentgenization preceding operation because the tissue changes induced thereby render the operation more difficult and dangerous. This is particularly true in enlarged cervical glands. "Ordinarily operations upon these are easy to perform, the glands readily peel out by blunt dissection, and the blood-vessels and nerves retain their distinct characteristics, thus being plainly recognized and preserved from injury." After roentgenization, however, the over-lying skin is thickened and toughened, the glands are hardened and sometimes shrunken, cannot be "pulled away from the blood-vessels and nerves by blunt dissection, but each step must be taken with the greatest deliberation and every particle of tissue that is removed must be separated by cutting with the knife or scissors." Fibrous thickening of the blood-vessel sheaths and surrounding tissues renders them difficultly distinguishable and the utmost

vigilance is necessary to avoid injuring vessels and nerves.

He also described a breast amputation in which the part had been roentgenized twenty-eight times before the operation and a severe burn inflicted. Microscopical examination demonstrated that there had resulted marked atrophy of the glandular tissue and extensive, diffuse, fibrous overgrowth. Although it cannot be positively stated that these changes were caused by the ray yet the picture is significant. Taylor believes that while the power for good of the Roentgen ray "is undoubtedly very great in inoperable malignant disease of a superficial character and as a prevention of the recurrence of malignant disease after operation" it should never be applied before operations.

**Effect of Roentgen Rays on the Development of Bone.** (*D. Recamier, Archives d'Electricite Medicale, March 25, 1906.*) From a second series of experiments conducted on the legs of young chickens and on the teeth of young cats, Dr. Recamier concludes that roentgenization has an evident action on the growth of bony tissue. The flat bones of the skull seem to be more susceptible than the long bones of the limbs. The different structures which constitute the bone do not undergo any remarkable histological changes. This influence of the rays should be known by radiologists. It is not likely that it will be used often therapeutically (though the writer reports a case of syphilitic osteo-periostitis which was greatly benefited by X-Rays) because there are other equally effective means of preventing hyperostosis, and roentgenization should be used only when those have failed. But radiologists

must be very careful and bear in mind the possible arrest of development of the skeleton, when administering Roentgen treatments to children.

**Roentgen Injuries and Their Consequences.** (*Franz Kirchberg, Fortschritte Auf Dem Gebiete Der Rontgenstrahlen, December 21, 1905.*) Kirchberg reviews the successive stages or steps by which the rays have been found to be injurious to the body. The following stages of injury have been noted: tanning of the skin, redness, burning and itching, destruction of the epithelial cells with little effect upon the elastic and muscular tissue; the development of chronic ulcers, or ragades, which sometimes take on a cancroid nature; the injury and finally the atrophy of the bone marrow and the splenic pulp; the production of oligonecrospermia, and later azoospermia.

Microscopical examination of the testicles of animals rendered sterile showed an atrophy of the epithelial cells and a decrease in the size of the testicles to one-third or one-half. Phillippe found that less exposure was needed to render his two cases sterile than was required for dogs and guinea pigs. Brown and Osgood noted the damaging effect of the rays upon the reproductive organs in eighteen men who worked with the rays. Halberstadt noted even a more rapid effect upon the ovaries of guinea pigs than had been noted upon the testicles. The practical importance of all these findings is to stimulate the physician to protect himself from injuries, and to protect his patients on account of legal responsibility in the matter. The author also calls attention to the fact that not only is the physician responsible for his own work but also for the

work of his assistants. Quacks or regular physicians who render men or women sterile purely upon social grounds are criminally responsible.

The conclusions are that on account of the dangerous possibilities of the rays they should be used only by physicians and these should be specialists; second that all who are exposed to the rays should be thoroughly protected.

**Roentgen Treatment and Roentgen Dermatitis.** (*Leopold Freund, Archives of the Roentgen Ray, April, 1906.*) Freund has been actively engaged in the practice of radiotherapy for nine years. He discusses the dangers of radiotherapy and does not find them so great as the public has been led to believe. The most dreaded is a primary dermatitis on account of its painful nature, protracted duration and resistance to treatment. Codmann claims that such burns do not occur once in five thousand times. In the Boston Hospital but four burns developed in twenty thousand exposures. Holzknecht got forty-four cases of ulceration in four thousand eight hundred and seventy-two cases of reaction following treatment.

Freund has treated three hundred and sixty-nine cases with a total of eleven thousand eight hundred and eight treatments. In these cases he had three intense reactions. The first occurred in a child, whom he treated for an extensive hairy nævus of the back. The child was exposed for two hours a day on twelve different days. At this time little was understood about the rays and the experiment was regarded as useless but harmless, but an extensive ulcerative dermatitis resulted which persisted for years.

The second case occurred in 1901, a woman having been irradiated several times for hypertrichosis of the chin, following which epilation the hair returned. The patient observed that the length of time elapsing was proportional to the degree of reaction induced. She begged for a severe reaction and got it. The epilation following was permanent but several painful ulcers developed on the chin which persisted for months and left marked scars.

The third case, a man with sycosis barbae, received similar treatment, enough dosage to produce the desired degree of reaction necessary to cure, but the patient became alarmed, consulted a dermatologist, who told him he was suffering from X-ray burns and advised him to bring suit for damages. The evidence in the case, however, proved that the reaction had produced marked improvement in the disease which had resisted other treatment for many years.

Many of these accidents occurred when radiotherapy was still in the experimental stage and nothing was known of possible complications and but little care taken to avoid them. Recent accidents are much more rare. These severe ulcerations are due to over-exposure either absolute or relative. A dose which when divided over several exposures does no harm and may produce the desired result, may if given at a single sitting be followed by a most intense reaction. Again a dose which ordinarily would barely suffice to produce the necessary reaction will in some patients, under certain conditions, cause an excessive degree of dermatitis. These cases are often due to some peculiar physical condition of the patient.

Freund observed one case, a young girl who was treated for hypertrichosis in the usual manner, in which it was noticed that on the third day of treatment, when she had received but two radiations which were not sufficient to have any effect according to previous experiments, yet a slight bare patch developed on the chin. No further treatment was given and the patient was told to return the next day when a pronounced dermatitis was found. Later it was discovered that this susceptibility was not due to an unusual dose as careful measurements had as usual been made, but the radiation had been given immediately before the menstrual period at which time the patient was much more sensitive to radiation. This was proven by a repetition of phenomena in the same patient, thus the Roentgen ray behaves as do other physical agents, since we know that the patients react differently to douches, baths, electric currents, heat, cold, etc. In the practice of roentgenotherapy a knowledge of the average dose required must suffice; though this occasionally will prove excessive yet the operator can not be held responsible for unforeseen results due to idiosyncrasy.

Numerous methods of measuring the dosage may be employed by observing the chemical, thermal, or electrical effect of the rays. Various radiometers measure the intensity of the rays by the production of color changes in certain chemicals, but are useless in scientific measurements since the effect of the rays on chemical substances is entirely disproportionate to the action on living tissue: they merely measure the quantity of rays which fall on the surface of the skin and not the quantity which penetrates to the seat of the disease. They are accurate

enough, however, for practical work.

The fluorescence of the tube may serve to prove the intensity of the ray. A deep yellow fluorescence indicates a more intense action than a dull greenish glow. The stronger the fluorescence the more intense will be the biological effect without exception. This method of measurement is safe as any and simpler than most, but it requires personal experience and practice to enable the operator to judge the color. Radiotherapy, however, must be learned practically under a skillful operator and not from books. Owing to the experience in the past few years and the progress made in measurements Roentgenotherapy has lost most of its danger.

Severe cases of ulceration following treatment are rarely seen, and where a case occurs in the hands of an experienced operator it should be regarded as due to idiosyncrasy, but cicatrization, pigmentation, atrophy, etc., may occur even where an acute reaction has been absent. The later changes in the skin such as atrophy, often appear a considerable time after radiation and since they are incurable they must be carefully avoided.

A study of such cases shows that they are caused by sufficient radiation having been applied to produce intense, long-standing erythema, such as is produced by the rays from a soft tube which are almost entirely absorbed by the skin. A hard tube however, may be used for epilation or the treatment of deep-seated conditions without producing much effect on the skin. With a soft tube a slight effect on deeper tissues is accompanied by an energetic action on the surface; thus we often see cases of atrophic change in the skin without permanent removal of the hair and again cases in which permanent epila-

tion occurred without visible skin changes.

A tube which produces a major quantity of penetrating rays and a minimum quantity of the softer rays will produce deep changes without visible skin effects. The rays from a soft tube affect particularly the tissues in the vicinity of the superficial papillary net-work. The more penetrating rays from hard tubes have little effect on the skin. These tubes should be used, then, for epilation, in the treatment of sarcoma and irradiation of the spleen, while the softer tube has a place in the treatment of psoriasis, lichen ruber, eczema, or rodent ulcer. The skin may be further protected by interposing a layer of some substance which absorbs the softer rays.

It has been alleged that it is possible to produce a dermatitis of one part while engaged in raying a distant part. If this occurs it is proof that the tube was not correctly placed or shielded. It is true that roentgenotherapy is not a radical cure for all cases in which it may be employed, but this is common of all forms of treatment. A failure is often due to faulty technic.

Danger to the operator may be practically eliminated by enclosing the tube in one of the numerous shields.

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**Protective Covering for Use in the Therapeutic Application of the Roentgen Ray.** (*P. A. Got, Archives d'Electricite Medicale, February 25, 1906.*) Dr. Got first takes a cast of the region with dental wax, a substance used by dentists to take impressions. This substance softens easily when placed in warm water, and remains soft enough if transported to the region by means of a wet and warm cloth. It hardens

quickly by simple cooling which may be accelerated by the use of a cold wet towel. After the cast has been made, its outer surface receives a coating of a paste made by mixing equal parts of powdered lead carbonate and plaster-of-Paris; this mixture is diluted with half its weight of water. The coating must be uniformly thick (about one centimetre). A rod may be attached to the cast while the latter is still wet, and may be later adjusted on any kind of a support.

In order to cut in that cast an aperture corresponding exactly in size and shape to the affected part, the operator draws the same first on a sheet of paper and cuts it out. Then, after wetting it, the paper is applied on the part and when it is adherent, the outer surface is slightly coated with mucilage, the cast is applied on the part and the paper comes off glued inside the cast. Nothing remains to be done but to cut out the corresponding part of the cast, preferably bevelling the edges. When it becomes necessary to modify the shape or the dimension of the hole, the former hole is first obdurate with the same paste and a new hole cut out.

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**Concerning Dosimeters and the Quantimetric Process.** (*Robert Kienbock, Fortschritte auf dem Gebiete der Rontgenstrahlen, February 22, 1906.*) Kienbock first considers the indirect method of designating the dose which consists of a statement of (1) the amount of current and voltage as found both in the primary and the secondary currents, (2) the effect upon the walls of the tube, as indicated by the amount of heat and the degree of fluorescence, (3) the effect of the penetrated rays as studied upon the flu-

orescent screen and the photographic plate.

The quality of the rays may be measured by estimating the penetration of the hand, or by using the Benoist scale. The distance of the anode from the part treated must be noted.

We have had heretofore three methods of direct estimation of the dose : Holzknecht's chromoradiometric pastilles, the radiometer of Sabouraud and Noire, and the iodoform solution of Freund.

The "Quantimeter" is based upon what Kienbock believes to be a rather constant relation between the chemical effect produced by the rays upon photographic materials and the effect upon the skin.

This outfit consists of a series of sensitized paper which is exposed to the rays and then developed in a developer of definite strength, and the resulting photographic effect is compared with a normal scale. The whole process requires three minutes.

The author has arranged a scale so as to estimate the deep effect. In general he believes that one millimetre of aluminum absorbs about as much of the rays as one centimetre of flesh. The amount absorbed varies however with the quality of ray used. He has even worked this out arranging the scale for each grade of light.

He estimates the cumulative dose by exposing a section of paper each time and one during the whole series, or he develops a specimen after a series of exposures. He calls attention however to the fact that the cumulative dose given at intervals is not as great in its effect upon the tissues as would be indicated by the "dosimeter," or as it would be if given in one dose.

**A New Method for the Production of Ultra-violet Rays and other Rays by Low Tension High Frequency Currents.** (*J. Cunningham Bowie, London Lancet, March 3, 1906.*) Bowie, recognizing the superiority of the Ultra-violet rays over the Roentgen rays in the treatment of many conditions has endeavored with success, to devise a method for their production which is free from the difficulties attending the ordinary forms of apparatus. Formerly it was impossible to make ultra-violet rays penetrate glass, moreover, their production was attended with a considerable degree of heat. He claims to have removed these difficulties and be able to produce a cold ray by means of low tension high frequency currents. Since the volume of rays produced is in direct ratio to the quantity of current used, and since these currents can be employed with perfect safety, he is able to produce a very intense ray.

His present machine consists of a transformer and condenser with a pair of helical coils, a primary and secondary helix which can be brought into apposition or placed at a distance from each other. This apparatus will deliver 10 amperes at 80 volts with a periodicity of 360,000,000 per second, and such a current to the amount of 6 or 7 amperes may be passed through the body without pain or danger. Virtually the whole of this current when employed with a vacuum tube, is converted into ultra-violet rays. The machine may also be used to produce high tension currents and the current from it used to excite Roentgen ray tubes.

Ordinarily ultra-violet rays are produced by an open arc, either with or without a condenser discharge. This is a wasteful method and there is difficulty

in keeping the lamp cool. The lamp which he has devised for use with this apparatus is nine inches long by three inches in diameter, tapered toward one extremity over which is placed a metallic cap, from which there leads into the tube for one-third of its length, a metal rod, terminating in the internal cathode, consisting of a disc of iron. The body of the tube is covered by a metallic cylinder, the external anti-cathode, to which is attached the other terminal. Between the cylinder and the tube is a packing of porous material to absorb heat.

The tube is connected with the secondary helix of the machine, which is removed to its greatest distance from the primary, and the condenser is raised so that the machine is working at its lowest capacity, whereupon the tube glows. The volume of rays is increased by approaching the secondary helix to the primary and increasing the capacity of the condenser.

The tube works silently and the ultra-violet rays emerge directly through the glass of the free end. A tingling sensation is felt where they strike the skin, but is not followed by a dermatitis. They are highly bactericidal, cause fluorescence of barium platino-cyanide even at a distance of 30 feet and after passing through a thick glass lens. They also cause fluorescence in solutions of quinine, æsculin, etc. They can be reflected, refracted and polarized, and will discharge negatively electrified bodies. They can penetrate five sheets of note paper and pass through mica, and, as thus produced, are free from the red or heat rays.

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**Treatment of Laryngeal Tuberculosis by Sunlight.** (*Artur Baer, Wiener Klin, Wochenschrift*, No. 10, 1906.) The

author has seen several cases of laryngeal tuberculosis treated by sunlight and the results are very encouraging. He reports two cases in which the effect was most pronounced.

*Case I.* J. K. entered sanitarium June 28, 1904. Large cavity of the left, catarrh of the right upper lobe. Infiltration of almost the whole right vocal cord with a peduncular lobulated tumor of the size of a little pea. Very hoarse voice.

On account of a high temperature local treatment of the larynx was out of question. The general condition and the lungs improved and by the end of December patient was much stronger and almost free from fever. The infiltration of the vocal cord apparently getting worse a curettage was done on December 29. The whole vocal band was spongy, soft and could be entirely removed. After this the patient became aphonic.

Since the middle of January, 1905, sunlight treatment after Sorgo's method was applied for fifteen minutes daily until February 25. Patient speaks for the first time again with a hoarse voice. A smooth cicatrix forms in place of the vocal band. Patient, after a short time, speaks with a perfectly clear voice.

*Case II.* B. L. entered sanitarium May 17, 1905. Infiltration of right upper lobe, catarrh of left apex. Diffuse infiltration of the left false vocal cord, the rest of the larynx normal.

Sunlight treatment began on June 16 and applied daily for from 15 to 25 minutes. After four weeks decrease of the swelling. On August 29 patient left sanitarium, but kept the treatment up in the city according to the principles learned in the institution.

She wrote on October 28 that she felt well and that her larynx showed com-

tinued improvement.

Sorgo's method is as follows: The patient sits before a mirror into which,

from behind the patient, the sun's rays fall. The rays are reflected into the laryngoscopic mirror.

## MECHANOTHERAPY

**Effects of Muscular Exercise on the Heart.** (*George L. Meylan, Journal of the Medical Society of New Jersey, May, 1906.*) In no way can the work of the heart be so readily increased as by muscular exercise. As a rule other conditions of life do not cause profound changes in its work as active organs are generally supplied with their needed blood by the dilatation of their arteries compensated by the contraction of arteries elsewhere.

Heart conditions as found clinically may be classified as follows:

### 1. *Weak Heart (untrained)*

(a) Small (undeveloped); (b) rhythm too rapid; (c) sounds not clear and distinct; (d) rate greatly increased by exertion.

### 2. *Nervous and Irritable Heart*

(a) Size may be large or small; (b) rhythm is irregular; (c) rate and irregularity increased by exertion.

### 3. *Hypertrophy*

(a) Normal hypertrophy of training; (b) excessive hypertrophy (athlete's heart); (c) compensatory hypertrophy.

### 4. *Dilatation*

(a) Excessive weakness; (b) strained from excessive effort.

### 5. *Organic Disease*

(a) Mitral regurgitation; (b) aortic stenosis.

A considerable amount of hypertrophy may be present without danger in athletes who are in training, provided the individual does not stop training suddenly, especially if the cessation of work is not accompanied by high living.

Excessive hypertrophy of athletes' hearts is found most frequently in those who indulge in violent forms of exercise, such as basket ball, distance running, hockey and rowing. A dilated heart is found in cases of recent illness and after too violent exercise in the untrained.

In order that the heart may keep up its normal strength it must have a reasonable amount of work to do and must also have proper nutrition. People whose lives involve a minimum of muscular exertion find that slight exercise produces palpitation. The writer has been impressed with the changes that have taken place in the size and condition of the heart under systematic exercise.

The writer takes the pulse in both the horizontal and perpendicular position at the beginning of the examination and again after the strength tests. The characteristics of a weak heart are a rapid pulse in the horizontal position, about 80; a considerable increase on standing, to about 100; and a very marked increase after the strength tests, to about 150.

The average increase in normal individuals is about 15 beats with a range of from 5 to 35. When a difference of 25 beats is found between the horizontal and vertical positions there is reason for looking carefully for other signs of cardiac disease.

Another simple means of testing cardiac function is by means of strength tests. Any muscular exercise involving a large expenditure of energy in a short time calls for increased action

of the heart and if the heart is strong it readily adapts itself to the increased demand, but a weak heart can meet the demand only by more rapid beating. The change in pulse-rate resulting from strength tests is therefore a valuable indication of cardiac efficiency. It is to be borne in mind that the heart is influenced more by speed of movement than by amount of work done. It is not uncommon among students to find the pulse over 150 after the strength test.

Observations made on eighteen football players demonstrated that eight weeks of training decreased the heart-rate 6 beats in a minute and also that the difference between the horizontal and perpendicular positions in pulse-rate was only 10 beats at the close of the season.

The following conclusions are drawn : (1) Muscular exercise may be a valuable agent in the cure of many forms of cardiac inefficiency. (2) Athletic sport when practiced without medical supervision produces more or less permanent cardiac weakness in untrained persons. (3) The difference in pulse-rate between the horizontal and vertical positions is a useful sign in the diagnosis of cardiac conditions. (4) The adaptability of the heart to suddenly increased work, as measured by the change in rate after muscular exercise, is a valuable indication of cardiac efficiency.

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**A Rational Classification of Massotherapy.** (*Charles Colombo, Journal de Physiotherapie, March 15, 1906.*) The classical division of massage manipulations, effleurage friction, petrissage, and percussion, is much too simple and is misleading because it leads to the belief that a good masseur need know nothing more.

The following classification is proposed by Dr. Colombo :

*Group A.* Rubbing Manipulations.

1. Effleurage.
2. Expression.
3. Friction.
4. Planing.
5. Combing (Kammgriff of German authors).
6. Petrissage (Kneading).
7. Rolling.

*Group B.* Pressure Manipulations.

1. Intermittent pressure.
2. Continuous pressure.
3. Vibratory pressure.
4. Circular pressure.

*Group C.* Shaking Manipulations.

1. Vibrations.
2. Shaking proper.
3. Arpeggio friction of the nerves.
4. Propulsions.
5. Succussion.

*Group D.* Percussion Manipulations.

1. Stroking.
2. Slapping.
3. Chopping.
4. Fist stroking.

*Group E.* Mobilisation Manipulations.

1. Friction.
2. Passive flexion and extension.
3. Torsion.
4. Rotation.
5. Pronation and supination.
6. Distension.

*Group F.* Combined Manipulations.

1. Mixed massage.
2. Kinetomassage.
3. Electrical massage.
4. Thermomassage.
5. Hydromassage.
6. Temporary expulsion bandage.

*Group G.* Special Manipulations.

1. General massage.
2. Abdominal massage.
3. Diaphragmatic massage.

4. Automuscular massage.
5. Mechanical massage.
6. Automassage.
7. Esocarde.

Some of these manipulations have a superficial, others (particularly groups C and D) a deep action. Some have a sedative, others a stimulant action.

## PSYCHOTHERAPY

**Influence of the Mind over the Functions of the Body.** (*E. W. King, Pacific Medical Journal, April, 1906.*) One important fact is evident, which all must admit, that there is an intelligent purposeful force which operates below the threshold of consciousness, which controls the vegetative functions. This force responds to stimuli when the organ of conscious intelligence, the cerebral hemispheres, has been removed, as it does in the normal conscious condition. The frog with both hemispheres removed, when a stimulus is applied to an end organ of a sensory nerve will react in a similar manner as it would in its normal condition; that is, it will, if placed upon its back, turn over, jump, swim if placed in water.

All the vegetative functions are properly performed. It has simply been deprived of consciousness, not mind, because it has lost the organ through which consciousness acts.

This force has been designated differently by different authors. Sidis, for instance, calls it the secondary self, the sub-conscious self; Scofield, the unconscious mind : Meyers speaks of it as subliminal, that is, below the threshold of normal consciousness in contradistinction to the term supraliminal. Others have used the term subjective self, giving the name of objective self to the normal mental condition. Now, these different names all practically mean one and the same thing, and are applied indiscriminately to the same conditions.

This subliminal consciousness has more the characteristics of a simple reflex action than that of a person governed by normal reasoning power, judgment or will. The hypnotic state brings this prominently into notice, removing the higher and controlling consciousness. It is particularly susceptible to suggestive influence.

"In hypnotic trance, the upper inhibitory, resisting consciousness being absent, we have access to the organic consciousness and through it to organic life. Strong, persistent impressions or suggestions made on the reflex consciousness of the inferior centers, may modify their functional disposition, induce trophic changes and may even change organic structure.

"But whatever the case may be with regard to psychotherapeutics, this much may be fairly granted, that the process of hypnotization consists in the separation of the higher inhibitory ganglionic cells from the rest of the cerebro-spinal and the sympathetic system.'

"The conclusions to which we have arrived are: 1. That the cerebral hemispheres are the organs of the conscious mind, and also of the choice, will, and inhibitory centers. 2. That in the midbrain, medulla-oblongata, spinal cord and the sympathetic system we have the anatomical mechanism through which act the subconscious psychic forces which control the vegetative functions of the body. 3. That when these two psychic forces during

our waking hours act together in harmony we have the normal waking personality. 4. That during normal or artificial sleep, hypnotic or otherwise, the conscious mind is in abeyance and the subconscious mind, which never sleeps, is still in control of the vegetative functions. 5. The subconscious mind is very susceptible to suggestion. Here we have the important facts which underlie the so-called hypnotic condition, and its use in the cure of disease. Man is a social animal and all social animals are more or less affected by suggestion. The hypnotic process itself is produced by suggestion and then we reach the organic functions by suggestions to the subconscious mind. As a matter of fact the term hypnotism is a misnomer and it is unfortunate that it has come into general use. To hypnotize a person means simply to put the normal supraliminal consciousness to sleep, that is, to separate it from and take from it the control of the subliminal or reflex consciousness.

"Here the process of hypnotism ceases, and what follows is the result of the mind of the operator by suggestion over the subliminal consciousness of the patient. There are two ways of using suggestion in the practice of psychotherapy. The one abrupt, crude, and almost brutal, the other reasonable, sensible, scientific and natural.

"The first a domineering, commanding, forceful method, even the conditions necessary for the production of the hypnotic sleep, when complied with reduces the activities of the mind of the

patient to a minimum.

"Dr. Sidis gives a synopsis of the conditions of hypnosis as follows: 1. Fixation of attention. 2. Monotony. 3. Limitation of voluntary movements. 4. Limitation of the field of consciousness. 5. Inhibition. Here we have all the conditions necessary to produce normal sleep."

Hypnotism properly used and in proper cases has done and is capable of doing good. The other method of using our psychic force for the cure of disease is not so spectacular but is more in harmony with nature's methods, because we appeal to the patient's normal conscious mentality, and through it in a natural way we reach the subconscious, or organic consciousness of the patient.

Here we have no disaggregation of the higher conscious will and inhibitory centers from the lower subconscious centers as in hypnosis but the entire mentality of the patient remains intact.

Dubois says: "In the treatment of the neuroses or the psychoneuroses, it should be our highest aim to restore to the patient his self control, and the means to be used in order to succeed is the cultivation of the will, or more clearly the cultivation of the reasoning faculties. Nervousness is a disease, pre-eminently psychic, and needs psychic treatment. The object of treatment ought to be to make the patient master of himself; the means to this end is the education of the will, or more exactly, of the reason."

#### DIETOTHERAPY

**Accuracy in Dietetics.** (*Dudley Roberts, The Journal of the American Medical Association, April 21, 1906.*)

The neglect of accurate diet regulation by the ordinary physician is deplored, and accounted for by assuming that

the matter has never been presented to him in practicable form. Food weighing is out of the question in ordinary practice, and the directions should cover what is actually eaten, not what is merely served, or serious mistakes will be made. He therefore presents a table giving the actual quantities used in ordinary household practice, and the number of calories and grams

of proteid contents to each measured spoonful, glass, or dish of the different foods offered for consumption. For patients requiring accurate regulation of diet this table will come into play and will also enable the physician to calculate with reasonable accuracy, the amount of nutrition that has been taken and to note the fact of the symptoms observed. The tables given follow:

TABLE 1.—VALUES OF COMMON FOODS IN HOUSEHOLD MEASURES.

FOODS AS EATEN.	Actual Amount	Household Measure	Calories	Gms. proteid	REMARKS
Milk . . . . .	8 oz.	a glassful	160	8.4	
Buttermilk and skimmed milk	8 oz.	a glassful	80	8.0	
Cream . . . . .	8 gms.	a teaspoonful	20	0.2	
Condensed milk, sweetened . . .	20 gms.	a heaping teaspoonful	50	1.8	
Condensed milk, unsweetened . . .	20 gms.	a heaping teaspoonful	30	1.8	
Cocoa powders . . . . .	10 gms.	a heaping teaspoonful	40	2.0	
Chocolate powders . . . . .	10 gms.	a heaping teaspoonful	90	1.2	
Beef juices, beef tea, bouillon, clear soup . . . . .	5 oz.	a teacupful	5-30	1.3	
Proprietary beef fluids . . . . .	8 gms.	a teaspoonful	1-10	4.2	
Beef and egg powders . . . . .	10 gms.	a heaping teaspoonful	30	8	
Thick or cream soup . . . . .	8 oz.	a soup-plateful	100-250	.....	Nutritive value increases as the thickness is made greater by proteid or carbohydrate addition to milk.
Alcohol . . . . .	1 gm.		7		
Whiskey, brandy, etc. . . . .	1 oz.		85		
Wines . . . . .	1 oz.		15-40		
Sugar . . . . .	10 gms.	a heaping teaspoonful	40		
Eggs, whole . . . . .	50 gms.	one	70		
Eggs, yolk . . . . .		one	55	2.4	
Butter . . . . .	10 gms.	a one-inch cube	65	0.6	
Cheese . . . . .	10 gms.	a one-inch cube	45	3.0	
Meat and fish, lean . . . . .	50 gms.	heaping tablespoonful	60	12.0	1/4 lb. of lean steak will thus give 185 calories, an ordinarily generous portion of rib-roast with moderate fat about 225 calories.
Meat, medium fat . . . . .	50 gms.	heaping tablespoonful	100	7.0	
Meat, very fat . . . . .	50 gms.	heaping tablespoonful	150	4.0	
Oysters, small . . . . .	8 gms.	one	3	.5	
Oysters, very large . . . . .	25 gms.	one	10	1.5	
Bread, slice 4 x 4 x 1/2 in. thick	25 gms.	one slice	50	1.5	
Crackers . . . . .	3-10 gms.	one	12-30	3.6	
Cereals, in cooked state . . . . .	30-40 gms.	a teacupful	110-150	3-5	A cupful equals a saucerful; a bowlful equals 2 cupfuls.
Cereals, eaten as purchased . . .	5-7 gms.	heaping tablespoonful	18-25	.5-.7	
Shredded wheat . . . . .	30 gms.	one	100	3	
Triscuit . . . . .	15 gms.	one	50	1.5	
Peas, fresh or canned . . . . .	35 gms.	heaping tablespoonful	25	2.0	The apparent low value due to large amount of water.
Peas, dried . . . . .	25 gms.	heaping tablespoonful	100	6.0	A tablespoonful of dried peas to a plateful of soup.
Beans, dried . . . . .	25 gms.	heaping tablespoonful	90	5.0	
Beans, fresh or canned . . . . .	30 gms.	heaping tablespoonful	30	1.0	
Potatoes, medium size . . . . .	90 gms.	one (3 inches long)	80	1.0	
Jelly, sweetened . . . . .		a teacupful	50-120	.....	Value depends on amount of sugar and gelatin used.
Apples . . . . .	100 gms.	one	40	.2	
Oranges . . . . .	125 gms.	one medium size	60	.5	
Bananas . . . . .	50 gms.	one medium size	45	.7	
Dried fruit, prunes, etc. . . . .	100 gms.	medium size saucerful	100-200	1-2	Value depends largely on the sugar used as preservative.

TABLE 2. FOOD DEMANDS OF ADULT PER DIEM.

Condition	No. calories to each 2 lb. body wt.	Total Calories	Gms. proteid
At rest in bed . . . . .	25	1800	72
Slight activity . . . . .	30	2200	88
Light work . . . . .	35	2600	115
Moderately hard work . . . .	40	3000	120
Very hard muscular labor . . .	45-55	3375-4100	135-160

TABLE 3. FOOD DEMANDS OF THE CHILD

Age	Proportion of food of adult at moderate work	Calories	Gms. proteid
Under 2 years . . . . .	30 per cent	900	42
Three to 5 years . . . . .	40 per cent	1200	55
Six to 9 years . . . . .	50 per cent	1500	70
Ten to 13 years . . . . .	60 per cent	1800	85
Boy, 14 to 16 years . . . .	80 per cent	2400	115
Girl, 14 to 16 years . . . .	70 per cent	2100	100

**The Dietetic Treatment of Obesity,** (*W. H. Allchin, The Practitioner.* April, 1906.) The formation of fat in the body (lipogenesis) depends upon several factors. In the normal adult male the adipose tissue forms about one-twentieth of the total body weight. It first appears at about the fourth month of foetal life and develops progressively to old age. It is liable to special increase, particularly in females, at puberty and the climacteric.

The body fat is derived from the food, directly though to an inconsiderable extent from the fat; indirectly from the proteid and carbohydrate foodstuffs. The chief source is the carbohydrate food. The ingested carbohydrates are absorbed into the blood mostly as dextrose. This is converted into glycogen, and stored chiefly in the liver and muscles. Ultimately the greater part of the carbohydrates is converted into fat, which is stored up in cells, especially those of the connective tissue, forming the fat cells of the adipose tissue.

The fat of the body derived from the fat constituents of the food is far less than that formed from the carbohydrate ingesta.

The amount of fat formed from the proteids either of the food or the tissues is inappreciable.

The fat of the body ultimately undergoes oxidation with the liberation of energy—heat, muscular and nervous action—but it is probably not made use of in this way at once. Much, and probably all, of it is stored up in connective tissue cells as adipose tissue, from which it is liberated by ferment action—lipase—and then stored up again before its final combustion in the muscular and nervous tissues.

The cause of obesity lies not only in

the nature of the ingesta, but even more in the behavior of the living tissue elements themselves. Consequently the regulation of the dietary of the corpulent is frequently but one of the methods to be pursued in the treatment of the condition.

The *first* and most obvious determining factor is an excessive intake, either of all the alimentary principles, or of special ingredients. Although large eaters may become unduly fat, on the other hand many persons, especially women, who are excessively corpulent, are small eaters, and again some large eaters are thin, and no amount of food will make them fat. An important influence in causing such differences is heredity.

An excess of sugar or starchy food often results in an increase of the body fat, but considerable differences exist among people as to the extent to which obesity will develop from this cause, and not uncommonly the degree will be slight.

The fat constituents of the food seldom much exceed the average amount. The natives of the Arctic regions, who consume large quantities of blubber, are considerably fatter than the average inhabitant of temperate or hot climates. When an individual's weight is reduced much below normal, a far larger amount of fat is absorbed than when he is in health.

A largely increased proteid intake causes no accumulation of fat, but rather the reverse, since the protoplasmic metabolism is stimulated by the nitrogenous ingesta, with accompanying increased oxidation of the fuel foods, fats and sugars. The effect of a large proteid dietary with a diminished amount of carbohydrate ingesta is seen in the spare, hard, well-

knit frames of the hunters on the plains of America, whose food consists almost entirely of meat.

The *second* condition which contributes to obesity is diminished muscular exercise, a diminished oxidation or using up of the fats of the body.

A *third* possible factor is a disturbance of the complex chemical changes which take place in the digested and absorbed fats and carbohydrates, and which are brought about, there is reason to believe, by ferments, many of which have been found in the tissues, some, possibly, contained in the internal secretions of certain ductless glands. The living elements of the tissues have a responsibility for obesity as well as the food from which the fat is derived. This helps to explain those excessive depositions of fat that are hereditary, or that take place at certain periods of life, notably the climacteric in women.

In the *fourth* place must be remembered the possibility that the errors of nutrition, which result in either obesity or emaciation, may be induced by a perversion of the normal trophic influence emanating from the nervous centers.

When the corpulence is associated with an excessive intake, the reduction of the dietary as a whole may be imperatively called for, but since it is the carbohydrate constituents of the food that are the chief sources of the fat, so it is their reduction that has especially to be taken in hand. The amount of fat ordinarily taken may be disregarded, and the nitrogenous food may be increased.

The Salisbury treatment consists in limiting the patient to three pounds of lean meat a day, with hot water, continued for at least two weeks. The

condition of the kidneys must be carefully watched. A loss of seven pounds a week may follow such a regimen, but it is not desirable that the loss should exceed three pounds a week.

Less severe methods are preferable in the majority of cases. All the sugar should be cut off at once, saccharin being substituted if necessary, and the starch foods and fats should be reduced by one half. This should be continued for three weeks, the weight being taken regularly. If there is a weekly fall in weight this plan should be continued. The use of bread, toast, cakes, biscuits, potatoes, parsnips, carrots, peas and beans should be discouraged, but green vegetables, salad and fresh fruits, in small quantities, and without sugar, are permissible.

In the anæmic obese, with flabby hydræmic tissues, a diminution in the fluid intake may be advisable; but, as the diet becomes more nitrogenous, fluid should be given, and almost without limit, to wash out the excessive waste.

Dietetic restriction should be pursued only with the greatest care by those suffering from chronic disease, or by the aged. The existence of albuminuria is a contraindication to any great increase in the proteid food.

A very much increased nitrogenous ingestion is not always borne with impunity, especially if the fluid intake be limited, and the circulation of imperfectly oxidized products of nitrogenous waste may determine cardiovascular troubles.

It is seldom advisable to pursue the regimen strictly beyond a loss of two stone (twenty-eight pounds), and often not to that extent.

## CLIMATOTHERAPY

**Tent Cottages for Consumptives.** *E. Fletcher Ingalls and John M. Dodson, Jour. A. M. A., January 20, 1906.)* The ordinary canvas tent, if properly constructed and set up, answers very well for tubercular patients during the summer season, but when the snow and rains and high winds of winter make their appearance something more substantial is required. A great desideratum is a light, easily ventilated structure which, while admitting as much fresh air as may be had in a canvas tent, at the same time provides sufficient protection from the elements and a modicum of the comforts and conveniences enjoyed at home.

It is the belief of Drs. Ingalls and Dodson that the tent cottage designed by Dr. W. T. Brown of Valmora Ranch, New Mexico, which they recently visited answers the purpose admirably. These cottages are constructed with one or two rooms and are arranged on either side of and facing the lawn in front of the main building, being exposed on all sides.

Each single-room cottage is 12 x 12 in area, is constructed of a frame-work of sixteen 2 x 4 uprights resting on 4 x 6 sills which are supported on a stone foundation. The five floor joists of 2 x 4 timbers support the floor of five-inch flooring. The sides are of five-inch drop siding to the height of 3½ feet, while the remaining 3½ feet of each side consists of twelve-ounce duck and three windows — one in front and one on each side — each window a six-pane 3 x 3 1-3 feet high, and sliding laterally. The canvas sides, stretched on frames of 1 x 3 inch pins, a little larger than the windows, are so arranged as to provide five sections, one on each side and three at the back of the cottage, which are

hinged at the top and opened by pushing out the bottom of the frame by a rod projecting through a hole in the wall just below the screened opening, so arranged that the frame is held firmly at any angle by a cord, which is also fastened from the inside. The door 2½ x 6½ feet is at one side of the front elevation. The gable roof, with a pitch of one-third, is of cedar shingles above, and between this and the ceiling of stretched canvas below is an air-space of four inches, opening by a series of large augur holes under the eaves and similar holes in the gable. These may be closed by a slide, so that this space may be made in cold weather a dead air space, the best of insulators, while in warm weather it may be opened and the air allowed to circulate freely between the ceiling and the roof.

Each cottage has a porcelain lavatory with running water and is furnished with a metal bedstead, the best of mattresses and bedding, a dresser, clothes-press, table, chairs, and a small stove. The cottages are neatly painted a light slate-color, with lighter trimmings; the roof an Indian red; the interior a restful light brown, with the floor a light slate. With the canvas sides and windows closed and a light fire in the stove, these cottages may be made perfectly comfortable for retiring at night and dressing in the morning.

At night, when the occupant has prepared for bed, the windows and canvas sides are opened from the inside of the cottage, the work of but a moment, and he is at once practically out of doors, though perfectly protected from the severest storms. All of the openings are well protected from flies, etc., by wire screens.





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